# agriculture

May 1967

Published for the Ministry of Agriculture, Fisheries and Food
by Her Majesty's Stationery Office

1s. 3d.
MONTHLY

Dairy Shorthorn calves

page 210

# There's only one word for a modern farm building

ATCOST

This farmer used Atcost know-how and resources to speed his modernisation plans and ensure his future profits.

Why? Because agricultural expansion demands good buildings. Atcost provide them.

When you use Atcost you get the full benefit of our skill, experience and resources as Europe's leading designers, manufacturers and erectors of modern farm buildings.

More and more farmers—on the Continent as well as in Britain—are using Atcost to push ahead fast with their modernisation plans.

**Paddock Wood, Kent.** Paddock Wood 333
**St. Ives, Huntingdon.** St. Ives 2491
**St. Helen's Auckland, Co. Durham.** Bishop Auckland 3961
**100 Northgate St., Gloucester.** Gloucester 26861

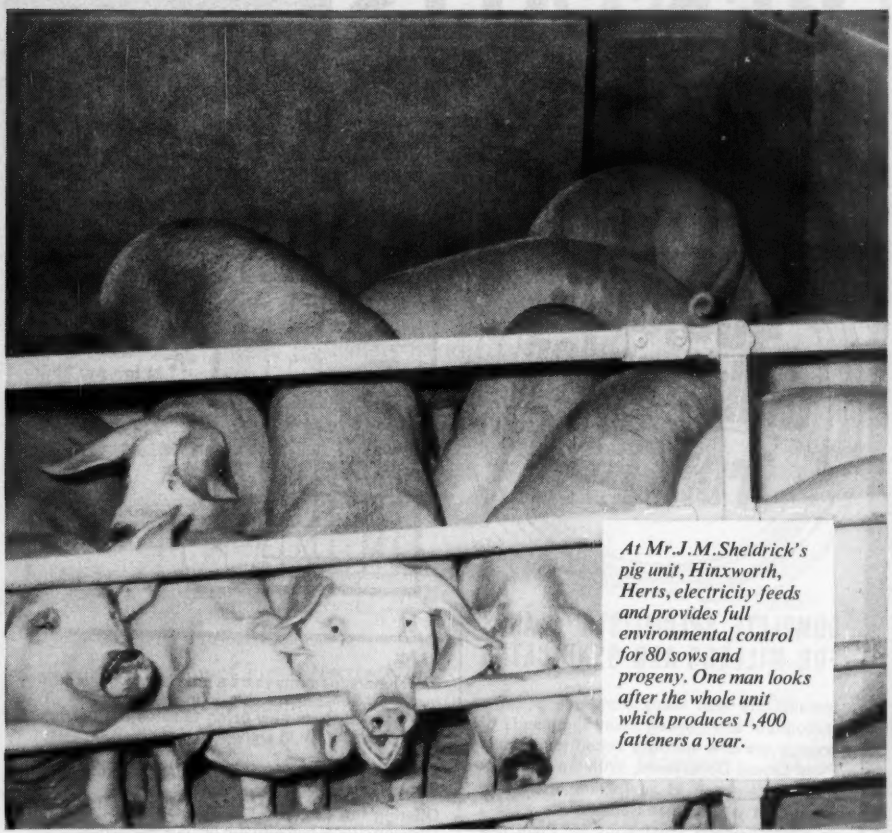
ATCOST (SCOTLAND) LIMITED
**1 Melville Terrace, Stirling.** Stirling 2532

ATCOST (FRANCE) S.A.
**62-Arques, France.** St. Omer 11.47 and 11.48

To: ATCOST LIMITED
Please send me full details of Atcost farm buildings and the Atcost service

Name.....
(Block letters, please)
Address.....
.....
.....
Telephone..... AGR. 10

# Electric farming pays



*At Mr.J.M.Sheldrick's pig unit, Hinxworth, Herts, electricity feeds and provides full environmental control for 80 sows and progeny. One man looks after the whole unit which produces 1,400 fatteners a year.*

## **Electricity** can save you time and labour

'ELECTRIC FARMING'—an illustrated booklet available free of charge—shows how electricity can save you time and labour in the management of livestock. Feed preparation, feed conveying, automatic feeding, heating, lighting and ventilation, are all referred to in this useful booklet.

Make sure you get a copy without delay. Contact your District Advisory Officer, Electricity Board, Agricultural Machinery Dealer or Electrical Contractor: or write to: The Electricity Council, EDA Division, Trafalgar Buildings, 1 Charing Cross, London, SW1.

## Better things are electric

*Issued by the Electricity Council, England & Wales.*

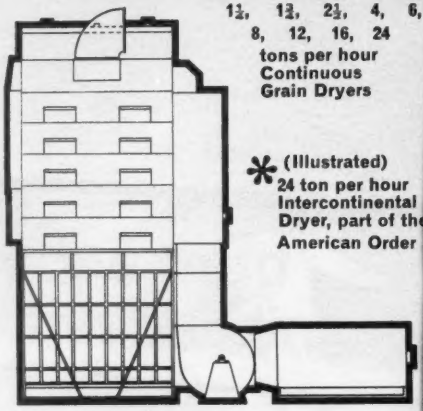
# BENTALLS BULLETIN

E. H. BENTALL & CO. LTD., MALDON, ESSEX.

BENTALLS for PROFIT making GRAIN DRYING INSTALLATIONS

RING MALDON (Essex) 4433

## 400,000 dollar order from U.S.A



1½, 1¾, 2½, 4, 6, 8, 12, 16, 24 tons per hour Continuous Grain Dryers

* (Illustrated) 24 ton per hour Intercontinental Dryer, part of the American Order

## COMPLETE SPECIALISTS' PLANTS FOR MILLERS AND SYNDICATES

Installations with many hundreds of tons throughput and costing many thousands of pounds are now specially suited to Bentalls Plant Layout Department. With the tremendously wide range of equipment offered by Bentalls it is rare that Bentalls are unable to offer complete Quotations for Plant and Machinery. Among recent orders is a £30,000 plant for Northern Ireland (the first in that area) for grain drying and feed processing.

**SYNDICATE JOBS** are a speciality and Bentall Quotations are keenly competitive.

Syndicate orders range from 300 to 800 ton capacity.

**RAPE**

In Denmark for many years a special study has been made by Bentalls for the drying of Rape and has led to us now being considered the Rape drying specialists in Denmark.

**Bentalls ADVISORY SERVICE:**

Offering the LARGEST ADVISORY SERVICE the Division concerned with the design and manufacture of grain drying equipment is one of the most important at Bentalls Maldon Works. Technical representatives will call, give advice and arrange for all the necessary planning facilities to be placed at the farmer's disposal, for either very large down to small installations.

**BAMCU AUTOMATIC MOISTURE CONTROL**

*(Based on the N.I.A.E. Design)*

The Bentall Automatic Moisture Control Unit (BAMCU) has a probe inside the Dryer which senses continuously 2 to 3 cwts of grain. This activation by such a large sample ensures an exceptionally high degree of accuracy. Constant automatic control of the moisture content of the Dryer is provided by a pre-set moisture content reading. The Bentall Automatic Moisture Control Unit can be supplied to fit any existing Dryer as well as to all new models.

*Ask for special descriptive literature on Bentalls BAMCU.*

# Agriculture

VOLUME 74 · NUMBER 5 · MAY 1967

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London S.W.1.

## Contents

| | page |
|---|---|
| Redesdale Experimental Husbandry Farm *P. J. Macfarlan* | 207 |
| Lord Williams of Barnburgh | 208 |
| Rearing Purchased Calves for Beef Production *J. M. Willcock* | 210 |
| Preventive Medicine on the Farm—Changes in Veterinary Practice *G. B. S. Heath* | 215 |
| The Economics of Caravan Farming *Thomas L. Burton* | 218 |
| Carrot Root Disorders *D. A. Perry* | 222 |
| The Soil Survey *K. E. Clare* | 225 |
| Cereals in the Common Market *D. R. Silvey* | 230 |
| The Ministry's Publications | 234 |
| Pipeline Feeding of Pigs *Hector Fraser* | 235 |
| Disposal of Farm Effluent—Public Health *S. T. G. Gray* | 241 |
| Farming Cameo Series 3: 52. Scarborough, Yorkshire *K. M. Thompson* | 245 |
| From the ALS: Handling Sheep on the Hill Farm *J. R. Mathias* | 247 |
| Book Reviews | 249 |
| Agricultural Chemicals Approval Scheme | 254 |

© *Crown copyright 1967*

Provided that the source is acknowledged in each instance such articles and notes as are published in this Journal without any specific reservation regarding copyright may be reproduced in any registered newspaper or public periodical without special permission. The Ministry does not accept responsibility for statements made. or views expressed, in signed contributions to this Journal or in those reproduced from another source.

Further, the Ministry does not accept responsibility for any of the private and trade advertisements included in this publication.

In the interests of factual reporting, occasional reference in this Journal to trade names and proprietary products may be inevitable. No endorsement of named products is intended, nor is any criticism implied of similar products which are not mentioned.

All communications respecting advertising in the Journal should be addressed to the Advertisement Contractors, Cowlishaw and Lawrence (Advertising) Ltd., Memorial Hall Buildings, 16 Farringdon Street, London E.C.4. Telephone: City 3718.

# If you laid 958 farmers end to end they'd stretch from Lower to Upper Slaughter

**—the 958 farmers who regularly prove that ICI fertilizers are right for your farm**

Who are these 958 farmers and what do they know about *your* farm? They are the farmers who take part in ICI's Farm Management Scheme up and down the country. This scheme is based on an exchange of farming experience and know-how. ICI keeps a strict account of the management and costing of these farms and in return gains valuable practical knowledge of modern farming developments. Profitable use of ICI fertilizers at the right rate, at the right time, is a key factor in this. What's in it for you? Just this: out of 958 farms in the scheme, there are bound to be several that have problems and opportunities very similar to yours. Why not take advantage of the experience in profitable farming methods gained from this unique operation by contacting your local ICI representative for advice on your particular needs.

ICI

**Bags of farming experience**

# Redesdale

# Experimental Husbandry Farm

THE Minister's announcement that negotiations were well advanced for leasing two farms in Northumberland to form the thirteenth E.H.F. brings to fruition efforts dating back to the origin of the National Agricultural Advisory Service in 1946. This completes the present plans for the establishment of a system of experimental farms covering the main types of farming in England and Wales and gives the Northern Region its first N.A.A.S. experimental centre.

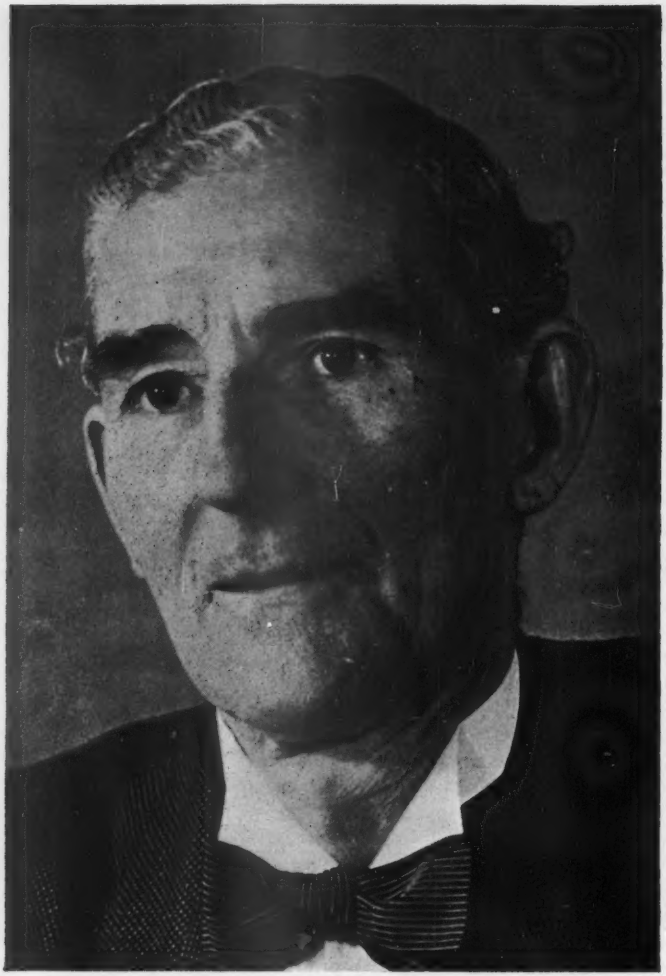
The need for facilities covering the important stock-rearing areas on the eastern side of the Northern Pennines was recognized in the original recommendations of the Agricultural Improvement Council, and has been reinforced by advice from the Agricultural Advisory Council and by strong pressure from farming interests in the northern counties regularly over the intervening years. The resources available had, however, to be utilized for equipping the experimental farms commenced between the years 1946 and 1956. The gift of Paradise Farm, Mepal, by the late Alderman Arthur Rickwood facilitated the establishment (in 1964) of the farm now bearing his name. Now the opportunity has come to lease two farms adjoining each other near Otterburn, Northumberland, and it is hoped that development of the facilities for experimental work can start next year.

The current emphasis on developing meat production, especially beef, from beef type stock, the need to improve production from upland and marginal areas and the financial problems of such farms make the establishment of this new E.H.F. very appropriate.

The search for a suitable farm has ranged widely over the north-east and the two farms Cleughbrae and Ashtrees are considered to provide fairly typical, if somewhat exposed, conditions. Although situated only 12 miles from Carter Bar the land is considered to be more typical of the Pennines than of the Cheviots. These farms carry a Blackface sheep stock of some 1,000 ewes and suckler herds, predominantly Galloway, totalling 90 cows.

The preliminary programme envisages experiments and investigations on methods of improving the productivity of such enterprises, with the main emphasis on economic methods of intensification. Naturally much attention will be paid to systems of wintering both cattle and sheep, including methods of housing, better nutrition and integration with lowground farms.

P. J. MACFARLAN



# LORD WILLIAMS of Barnburgh

## Minister of Agriculture

## 1945-1951

ALL of those who knew Lord Williams of Barnburgh always spoke of him as Tom Williams, or even just Tom. This was an indication of the real affection in which he was held whether in political circles, in the Civil Service, in the agricultural industry or elsewhere. For those of us who served under him

during his long association of 11 years with the Ministry of Agriculture, first as Joint Parliamentary Secretary, and then as Minister, this affection was especially strong and we always thought of him throughout the remainder of his life as 'our' Minister.

Tom Williams was one of 'nature's gentlemen'. Although this is a trite phrase, it is one which most truly described him. He was unfailingly courteous to all who came into contact with him, high and low alike. No matter what the circumstances he always retained a natural dignity, which was enhanced by his chiselled and distinguished profile, and by the wing collar and meticulous dress that he always wore, whether in the House, in the office, on the farm or on the race-course. He never raised his voice in anger or said an unkind word to those who served him or about others behind their backs. Nor did he ever allow the continuous pain that he suffered from the rheumatoid arthritis which troubled him increasingly up to the end of his life, to break through the patience and thoughtfulness for others that he always showed.

It might be thought that these qualities would not have fitted him for the rough and tumble of politics. Yet he was a great Minister of Agriculture, and achieved more than many others. He got his way, not by a forceful and thrusting personality but by a gentle charm and persuasiveness that others found difficult to resist. His Ministerial colleagues found it difficult to deny him what he wanted; the House felt it would be almost 'hitting below the belt' to criticise or embarrass him too strongly; the farmers, farmworkers, and landowners, no matter what their political beliefs, were anxious to please him and follow his lead; while his officials were only too anxious to serve him to the best of their ability, however long and arduous the tasks he set.

Tom Williams always retained a great admiration for the Ministry of Agriculture and for the officials serving in it, many of whom were his personal friends. In his autobiography 'Digging for Britain' he wrote this about them:

> 'In particular I recall the tremendous loyalty and skill of the civil servants who worked under me at various times. It is a trite sentiment but a true one that these men are people of whom Britain can be justly proud. Everyone hears about it if a civil servant makes a mistake. We forget the long years of hard work without error.'

Apart from agriculture Tom Williams' other abiding passion was racing, an enthusiasm which he acquired in his mining days. He was fortunate to find during his time as Minister that the National Stud was one of his responsibilities, and he not unnaturally took a keen personal interest in it. It was typical of him that when he retired, he remained within sight of his beloved Doncaster race-course, the home of the St. Leger.

So far these notes have been concerned mainly with Tom Williams the man. But it would be wrong not to refer also to his career and achievements. Tom Williams was the son of a miner and one of 14 children. He went to work in the pits as a pony boy at the age of 11. Here he took an interest in trade union affairs, and from this it was but a short step to politics. He was returned as the Member for the Don Valley division of Yorkshire in November 1922 with a majority of over 4,000, and retained the seat throughout his Parliamentary career until he retired from the House in 1959. He became Joint Parliamentary Secretary to the Ministry in 1940, and helped the then Minister, Mr. R. H. Hudson, to put agriculture on a wartime footing. After the war he became Minister of Agriculture in the Labour Government of 1945 and retained this post for six years, until the defeat of the Labour Party in the

1951 election. During this time he completed the agricultural revolution. Tom Williams left office with the satisfying knowledge that during the 11 years of his association with this Department agriculture had changed from a declining and relatively unimportant industry into a strong expanding one of great importance to the national economy. Much agricultural legislation was passed during Tom Williams' term of office, but his name will in particular always be associated with the Agriculture Act of 1947. This gave statutory authority to the Annual Price Review machinery and has remained the foundation of agricultural policy for successive Governments, both Labour and Conservative alike.

It is perhaps most fitting to end this appreciation of Tom Williams with the tribute paid to him by Lord Attlee, who in November 1951 wrote to him in the following terms:

> 'My dear Tom,
>
> Great pressure of work and the change over from No. 10 to Cherry Cottage has prevented me from writing before. I want to tell you how much I appreciate the great work you did as Minister of Agriculture and to thank you for your loyal support at all times. You have broken all records for work at the Ministry both by time and magnitude of achievements. No one else could have done it. You know how widespread is the feeling which I express.
>
> Yours ever,
>
> Clem.'

---

# Rearing Purchased Calves for Beef Production

**J. M. Willcock**

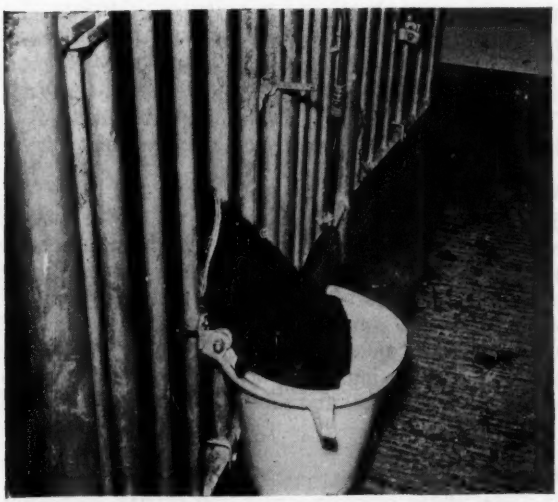
*Director, Liscombe Experimental Husbandry Farm*

---

THE 1966 June returns show that, in addition to bulls being reared for service, there were 1,187,000 male cattle under one year old in England and Wales. It is fair to assume that the vast majority of these are being reared for beef production. This is three-quarters of a million more than in 1952. Half a million of these were calves from herds kept mainly for producing milk or rearing calves for the dairy herd. These figures give a good indication of the increased contribution from the national dairy herd to our home-produced beef supply.

Before 1952 most purchased calves were reared either on a multiple suckling system or bucket fed for a considerable length of time. Now, the vast majority are reared on an early-weaning system. The method was evolved from research work undertaken in the early 1950s. At that time there was a surplus of skim milk at the creameries which was dried and the powder used as a milk substitute for calf rearing. Early substitutes contained a mixture of skim milk powder with oat flour and added vitamins, and liquid feeding usually continued for at least twelve weeks and often longer. It was quickly appreciated that a calf would commence dry feeding at a very early age and mixtures containing easily digested carbohydrate foods with animal protein of high biological value, vitamins and minerals formed what is now generally known as 'early weaning concentrates'. It became apparent that the calf began behaving as a ruminant at an early age when given access to solid food. Liquid feeding was gradually reduced to the now accepted period of between 3 and 6 weeks of age.

In practice, the length of time whole milk is fed varies considerably. It depends on the liquid price of milk at the time the calf is born; if it is at a period of the year when it is relatively low then the calf is likely to have a greater quantity. The price the calf will probably make has some influence. When trade is firm the calf will more likely be kept on whole milk for a longer period. However, milk producers generally tend to dispose of their calves at between 4 and 10 days old.



*Calf in individual pen bucket feeding through yoke*

## Colostrum

It is well known that colostrum is of high feeding value to the new-born calf. It also contains substances which affect the calf's ability to fight off disease in the early period of its life. What is not so well known is that it may not be able to produce its effects if administration is delayed—in some calves delay for more than six hours will diminish the chances of survival of the calf.

## Hygiene

One reason why it is so important that the calf gets colostrum within a few hours of birth is that its gut wall at that stage is very permeable and so allows the disease-resisting substances to pass through. By the same token, disease organisms can equally easily gain access; therefore strict rules of hygiene at calving time and subsequently are of vital importance for calf survival.

In recent years salmonellosis has been an increasing hazard in calf rearing. The introduction of a vaccine has gone some way to overcome the problem, but the number of deaths could be reduced further if the vaccine is given soon after birth. If calves are to be sold, it is recommended that they should be retained on the farm for at least a week after vaccination. Ideally, calf purchases on a farmer to farmer basis would help to reduce disease. Although desirable, this is not always possible but more could be done to prevent cross infection both at markets and dealers' premises. The young calf is very susceptible to change in environment and long periods spent in travelling do not increase its chances of survival. Draughts at any stage are to be avoided.

## Management

The baby calf is best looked on as an individual and treated as such. Separate pens are an advantage but not always practicable. The larger the group size the greater are the problems of management, especially if there should be a disease outbreak.

There is generally a greater risk from overfeeding than from underfeeding. Glucose and water is better than a full feed of milk substitute on arrival, followed by gradually working up to full-strength feeding over 3–4 days. A constant temperature is important and feeding too hot a solution should be especially guarded against as this will most likely bring about scouring problems. The practice of using the elbow as a guide to temperature is as good as a thermometer. The importance of thoroughly cleaning utensils cannot be overstressed. Any change in the feeding regime should be gradual.

## Food consumption

Whole milk is undoubtedly the ideal feed for the young calf but because of its relative cheapness, substitutes are based on dairy by-products, notably skim milk. The method of drying can have some influence on the feeding value, there being a danger of denaturing and lowering of digestibility if overheating takes place. Although skim milk powder alone has been used successfully, most substitutes now contain added fat. How this fat is incorporated and the size of globule are important factors, but manufacturers have paid much attention to the processes and substitutes generally are quite reliable.

## Automatic feeding

In attempts to cut down labour requirements in calf rearing, numerous methods of batch rearing have been introduced. These have varied from the use of a relatively simple system of cafeteria feeding from a container through plastic pipes and rubber teats to more complicated machines in which water is heated, the food metered and automatically mixed in a continuous cycle. All go some way towards automation and have been quite successful, but unless a careful watch is kept on consumption there is a tendency for the consumption of substitute to rise above the quantity which is generally accepted as adequate under an individual feeding system.

*Automatic calf feeding*

## Dry feed

The young calf behaves as a non-ruminant; liquid taken by a sucking action by-passes the rumen. At an early age it will commence to eat dry food and quickly become a ruminant. To wean early, dry feeding usually commences at about two weeks old. A high energy early-weaning mixture is essential. For small numbers of calves compounds prepared by the foodstuff manufacturers are probably the easiest and most convenient source. For large numbers and when facilities for processing and mixing are available, home prepared mixes are cheaper especially if some of the ingredients are produced on the farm. A mix which was introduced at the Rowett Research Institute, based on the following ingredients has proved very satisfactory:

8 cwt Maize flakes
6 cwt Rolled oats or barley
3 cwt Molassine meal
2 cwt Fish meal
1 cwt Soya bean meal

20 cwt (plus suitable mineral and vitamin supplement)

The young calf quickly takes to roughage which should be on offer from about two weeks. Young leafy hay is desirable as very coarse hay or bedding straw can accumulate in the form of an undigested ball in the rumen and cause fatalities.

## Weaning

Provided the health of the calf has been satisfactory and it has had sufficient opportunity to eat dry food and roughage over a period of 2–4 weeks, then there is everything to be said for weaning off liquid feed. The time taken in food preparation and feeding is reduced and the risk of a setback through the development of nutritional scours is almost eliminated once the calf is on dry feed. Having become a ruminant it can utilize starchy and other carbohydrate foods which are far cheaper than milk substitute.

Various yardsticks are used for timing the end of liquid feeding. On an age-basis weaning may vary from 3 to 8 weeks. Perhaps a word of caution

may be in place to the advocates of very early weaning. Much of the early investigational work on the subject was undertaken as a means of rearing dairy heifer replacements. It is accepted that a heifer will continue to grow until after its second calf. It has, therefore, a long period over which to reach its mature size. In present-day beef production beasts are usually slaughtered well before they reach a comparable age, so to obtain a quick turnover an adequate level of feeding is desirable during the calf stage. About 5–6 weeks does appear to be the optimum age for weaning calves for beef production.

Another criterion frequently used is the daily intake of concentrates. Rearers will wean when calves are eating from 1 to 2 lb per head per day. The lower figure is accepted as a minimum if it can be certain that it is the minimum each calf is eating and not the average consumption by the group. Some calves take longer to reach the minimum quantity set and are likely to check more on weaning. This further illustrates the advantage of having them in small groups.

Weight of calf is often used as a yardstick for weaning. Calves vary according to breed and cross but, as an example, assuming an initial weight on purchase of 90 lb which is a fair average for market calves suitable for beef, weaning at 130 lb has proved satisfactory. To take into account lighter calves, then the criterion can be that they have to put on 30 lb liveweight before being weaned.

## Subsequent management

After weaning the usual practice is to allow free access to good quality hay or silage and early weaning concentrate up to approximately 12 weeks of age. Subsequent feeding management depends on the system of beef production to be followed. For 'barley beef' a high concentrate ration will be fed throughout but with a gradual change-over to one containing from 85 to 90 per cent cereals. For finishing at between 15 months to 2 years grass will come into the system either as grazing or conservation. No matter what the ultimate system, the importance of the relatively short calf-rearing period is a key factor in success.

## The future

Without doubt the introduction of early weaning has had a tremendous influence on beef production. But still the quest for more information goes on. Cold milk substitute feeding, once a day feeding, high fat or a moderate fat level, information on calf environment, optimum temperature of the buildings, is to mention just a few of the thoughts which occupy the minds of those endeavouring to improve still further on techniques of rearing. This quest for further knowledge is the life blood of progress. Nevertheless the skill of one of the most important members of the agricultural community must not be forgotten. The industry still leans heavily on its stockmen.

---

**The following article on Animal Health and Disease Prevention is the first of a series. Further articles on this subject will be published in the June issue of Agriculture.**

# Preventive Medicine on the Farm

## Changes in Veterinary Practice

G. B. S. Heath

CHANGES in farming which led to the establishment of the first Veterinary School in Great Britain in 1791 were described by Field in the *Journal of the Royal Society of Arts* (*1964*) *Vol. CX 11.* Although the profession had probably been static for some 4,000 years previously, it has changed constantly during the past 200 years. The changes all seem to have been a direct result of changing methods of farming or problems which arose in livestock production. When disastrous outbreaks of rinderpest occurred during the nineteenth century, veterinary surgeons turned partly away from horses and concentrated on stamping out the disease in cattle. Tractors became common and milk production became more important during the second world war; the farm horse has slipped almost completely into the background, to be replaced by cattle practice. Pigs, poultry and small animals have now become more important and these events have all had profound and obvious effects on veterinary practice. Equally important but less obvious changes have occurred—all related to changes in farming.

### Origin of preventive medicine

The syllabus taught in veterinary schools always included the basic facts needed for prevention of disease. Unfortunately, farmers were reluctant to take advantage of this and the veterinary surgeon tended to occupy himself with curing animals which were already ill. Advice on prevention of disease was frequently offered and accepted, but the farmer did not look on this as being a service worth buying.

It was unfortunate that the evolution of the profession included this stage in which preventive medicine did not form a prominent part of practice. There are few things more mentally rewarding than successful treatment of an animal which would otherwise have died, but much of the satisfaction disappears if it is known that the disease could have been prevented. From the farmer's point of view, it is more satisfactory and generally cheaper to prevent illness in livestock than it is to treat cases as they appear. Lack of money in the farming community and failure to appreciate the benefits which may arise from the practice of preventive medicine are possible reasons why an unsatisfactory situation continued for such a long time. The establishment

of preventive medicine is certainly associated with more intensive methods of keeping livestock and the realization by progressive farmers that preventing disease increases the profit.

It is impossible to look back and say that any given point in time marked the introduction of preventive medicine. In the days of the Old Testament, shepherds on the hills probably tried to provide shelter and warmth for new-born lambs on cold nights and this is a perfectly good example of preventive medicine. There must be hundreds of similar examples but it is fairly safe to say that poultry farmers led the way to preventive medicine on a large scale. They were forced into it when really intensive methods were developed.

## Dangers of intensive methods

There is a tendency to think that intensive methods of rearing livestock increase the chance of disease developing. This is not so. The man who has invested his capital in an intensive system will not risk disaster by obvious faults in management. Intensively kept animals are, on the whole, less likely to become ill than if they were kept extensively, because they are managed more carefully. Preventive medicine is so important in these systems because, if disease does occur, more animals are likely to be affected. If they are kept in close contact, infectious or contagious diseases may affect almost all of them. An error in management or feeding can be just as important as an infectious disease when big numbers are kept. Under modern conditions, poultry farmers are sitting on a volcano and the veterinary profession is continually helping them to prevent an eruption. Now that pigs, calves and sheep are being crowded together, the responsibilities of the profession are becoming even greater.

## Shot-gun wedding

The change in veterinary practice has had wide and welcome repercussions; complete collaboration between the farmer and his veterinary surgeon is essential. They must discuss housing, feeding and management and the farmer must keep good records. It is interesting and convenient to find that records needed by the veterinary surgeon are almost identical with those asked for by the accountant. Both professions are interested in securing a profit for their client.

No amount of good management can overcome the effect of poor food, and merchants have collaborated magnificently to provide good diets. Most of them now employ a veterinary staff and are active in doing research. Similarly, the agronomists and their associates have played an enormous part in the increase in animal production; they have worked and are working in collaboration with their veterinary colleagues.

It seems to be very necessary for everybody connected with farming to collaborate if disease is to be prevented. The veterinary profession is more closely connected with disease prevention than most other people, but good results follow only when communication is good between the parties concerned. The farmer, N.A.A.S. adviser, agronomist, economist, food compounder, architect, accountant and veterinary surgeon are all in a loose partnership designed to produce as much animal protein as possible. Animal disease may prevent their efforts succeeding and all play their part in keeping livestock healthy.

## Communications

The most difficult part of the exercise has been dissemination of information. Telling a farmer what to do, and persuading him to follow the advice, should be easy—but it is not. Most of the vaccines for sheep diseases do not work unless two doses are given and there must be an interval of at least one month between the doses. Many articles about this have been published in the farming press, lectures to farmers have stressed the point and every bottle of vaccine is accompanied by detailed instructions. A distressingly large number of sheep still die because they have had only one dose of vaccine—and this is only one of many instances where communication is known to break down.

The veterinary profession has now started 'study groups' all over the country in an effort to solve the problem. Few would claim that these have been an unqualified success. It may be encouraging to find that other groups find the difficulties of communication insuperable, but it is a pity that many animals die or produce less because available information is not applied. A visit from the veterinary surgeon *when the farmer is having trouble* with his animals seems to be the only sure way of getting information across.

## Research

'A man's judgement is no better than his information' is a self-evident truth and veterinary surgeons would be unable to provide good help for the farmers if they did not have sufficient knowledge about current problems. Fortunately, there is a well-organized veterinary research organization in Britain. The Central Veterinary Laboratory at Weybridge, university veterinary schools, commercial firms and the Veterinary Investigation Service are all working on problems which have arisen on the farms. It is difficult for a member of a profession to write about it objectively, but most farmers consider that the Veterinary Investigation Service is an essential part of the veterinary service which is now available to farmers in this country. Without it, veterinary surgeons would find it difficult to provide such a good service to their clients.

## A difficulty

Farming methods are changing so rapidly that it is difficult for the veterinary profession to know about all new developments before they are widely used. In some cases, this allows development of disease which could have been avoided if veterinary advice had been available before the method got well under way. Efforts are now being made to overcome this defect but complete success is unlikely because many of the new methods are developed by farmers themselves. Regular consultations between the farmers and their veterinary surgeons will help.

---

This article has been contributed by **G. B. S. Heath, B.Sc., F.R.C.V.S.**, who is the Superintending Veterinary Investigation Officer at the V.I. Centre, Newcastle upon Tyne.

# The Economics of Caravan Farming

**Thomas L. Burton**

ONE of the biggest problems in the agricultural industry today is that of the farmer trying to obtain a livelihood from a relatively small area of land and with a limited amount of capital. The problem is acute in the hills and uplands, where remoteness and an adverse natural environment often add to the difficulties arising from lack of size. On many small farms the labour force, consisting largely of the farmer himself and his immediate family, is very inflexible in relation to the available land resources. This labour force is under-employed almost continuously throughout the year, being fully utilized during relatively short seasons only. This unfavourable ratio of labour to land is the basic difficulty faced by these farmers and it is largely responsible for the low incomes that they earn.

It has been suggested that one solution would be to encourage this type of farmer to undertake the operation of an outdoor recreation enterprise as a complementary or supplementary activity to his normal farming enterprises. In this connection, the White Paper on the Development of Agriculture (August, 1965, Cmnd. 2738) suggested the establishment of a number of Rural Development Boards in problem rural areas. These would have powers to make grants to the owners and occupiers of agricultural or forest land to facilitate the additional use of such areas for recreation and tourism, e.g., for the provision of camping and caravan sites and farmhouse accommodation for holiday-makers. The provision of such facilities is not, of course, confined solely to farmers in problem rural areas; but it is only within these areas that attention is being given to their deliberate promotion. Many of those who already make provision for holiday-makers have farms in better agricultural

areas and obtain a satisfactory income from their overall farming operations. For these farmers, the income obtained from the provision of holiday and tourist facilities is primarily a supplementary income. But for farmers in problem rural areas, it could be the means of raising incomes from a sub-marginal level to one that provides a satisfactory living.

It is useful to know exactly what is meant by a supplementary enterprise to farming. This may be defined as an enterprise whose establishment and operation does not significantly affect the scale of the farming operations already taking place. For small-scale farms this means that the establishment of the recreation enterprise should not cause any substantial reduction in the area of land available to the farming enterprise, since land is usually the limiting resource on such farms. In other words, the proposed recreation enterprise should use a relatively small acreage. The object of this article is to assess, in general terms, the economic potential for farmers from the operation of one kind of supplementary recreation enterprise—a caravan site.

## Growth of caravan holidays

The holiday and tourist industry has been one of the fastest-growing in Britain during the past fifteen years, and the use of caravans by holiday-makers has been one of the most significant elements in this growth. In 1951, about 25 million people went away from home for an annual holiday. By 1964, the numbers had risen to over 30 million. But perhaps more significant than this growth in the total numbers of holiday-makers has been the change in the relative popularity of the various kinds of accommodation which they use. In 1951, so few people were using them for holidays that caravans were not even classified as a separate category of accommodation in the survey of holiday-making made in that year by the British Travel Association. By 1955, however, the numbers taking caravan holidays had risen to about 2 million (8 per cent of all holiday-makers) and by 1964, to over $3\frac{1}{2}$ million (13 per cent). Over roughly the same period, the number of people staying in licensed hotels rose by only 5 per cent.

## Types of site

The greater part of this growth in the popularity of caravan holidays has been associated with the rapid development of static caravan sites. These are sites upon which caravans remain throughout the year, or at least throughout the holiday season. More than 90 per cent of the 2,700 approved holiday sites that existed in 1965 were of this kind. There are, however, some approved sites which cater primarily for tourist caravanners, i.e., holiday-makers who tow caravans behind their cars from one place to another, remaining on a site for, at most, a week or so. Almost all of the sites which have been established as supplementary enterprises to farming cater for this type of caravanner.

The farmer who is considering the establishment of a caravan site must not only choose between a static site and one for tourist caravanners. He must also decide whether to operate a large licensed site or a small unlicensed one. The Caravan Sites and Control of Development Act of 1960 recognized three main kinds of holiday site. Firstly, there is the licensed site, approved by a planning authority and licensed by a local Borough or District Council. Secondly, there is the unlicensed site, operated by an *exempted organization* under the Act and unrestricted in size. Thirdly, there is the unlicensed site, restricted either in size (to a maximum of five caravans) or in the period of

operation (to a maximum of 28 days in the year) or both. The farmer can choose to operate a site within either the first or the third of these categories. He can operate a small unlicensed site for five caravans or a larger site for which he must obtain planning permission and a licence. Many farmers in popular holiday areas operate small sites which are approved and certified by the Caravan Club—an exempted organization under the Act. These are sites in the third category above, which are restricted in size to a maximum of five caravans but are unrestricted as to period of operation within the holiday season (March to October).

**THE AUTHOR**

This article has been contributed by **Thomas L. Burton, B.Sc.(Econ.),** who is a Research Associate at the Centre for Urban and Regional Studies, University of Birmingham. Until the end of last year, Mr. Burton was a lecturer at Wye College, and he has written extensively on the subject of outdoor recreation in the countryside.

## Costs and returns

These small sites can make a very useful addition to farm revenues in return for a minimal outlay. For example, there is a dairy farmer operating such a site in a popular coastal holiday area in the South-West who has incurred no capital expenditure at all. He makes provision for tourist vans only and does not, therefore, require hard standings for the caravans. Nor does he provide lavatories; instead, the visitors must provide their own sanitation facilities. There are already a number of surfaced roads through the farm, which connect with most of his fields. He can, therefore, use almost every field in turn for caravans, and this fits easily into the existing pattern of rotation for his dairy herd. His main expenses are incurred in moving dustbins from the caravans to the farm each week, since the dustmen will call only at the farm. For this outlay, he is able to obtain a return of 7*s.* 6*d.* per caravan per night. If, therefore, he were to receive five caravans each night throughout the four weeks of the peak holiday season only (from late-July to late-August), his revenue from this source would be about £90. In fact, as his farm is in one of the most popular holiday areas of the country, he is likely to receive visitors for a much longer period. His revenue in a good season could be as much as £200, or more.

The alternative to a small unlicensed site is a larger licensed one, but the latter will involve the farmer in some capital and operating expenditure. From studies of a number of existing sites, it is calculated that an investment expenditure of up to £1,000 would be needed for the establishment of a site for about 30 caravans.* This would be incurred for the provision of such

*These studies are contained in Chapter 3 of *Outdoor Recreation Enterprises in Problem Rural Areas*, by the writer. This is shortly to be published as Report No. 9 in the series *Studies in Rural Land Use*, from Wye College, University of London.

facilities as lavatories, water pipes, fencing and an incinerator. Operating expenses would probably amount to about £250 for such items as public liability insurance, advertising, sanitation, repairs and maintenance and general and water rates. These expenses are shown in the table below. After allowing for interest charges on capital investment at a rate of 7 per cent, it can be seen that a revenue of £320 would be required in order to break even. At a uniform charge of £2 per caravan per week (the most usual charge on existing sites), this implies a total of 160 caravan/weeks—say, a minimum of 11 caravans on the site at any time throughout a three-month holiday season.

**Estimated investment and operating expenses of a site for 30 caravans**

| | £ |
|---|---|
| *Capital outlay* | |
| Lavatory block | 700 |
| Water pipes, fencing and incinerator | 150 |
| Miscellaneous capital works | 150 |
| Total | 1,000 |
| *Operating expenses* | |
| Public liability insurance | 5 |
| Advertising | 30 |
| Sanitation | 50 |
| Repairs and maintenance | 45 |
| Rates, excess rental and miscellaneous items | 120 |
| Total | 250 |
| Interest on capital investment at 7% | 70 |
| Revenue required to break even | 320 |

## Importance of location

Whether or not sufficient visitors can be attracted to the site will depend upon such factors as the location of the site, particularly in relation to popular coastal resorts, the availability of other sites, and the state of the weather during the main holiday season. The general evidence from the studies mentioned previously is that large numbers of visitors are only likely to be attracted to areas which already have developed holiday facilities. About 70 per cent of all holiday-makers in Britain each year take their holidays at the coast, most of them in the urban seaside resorts. It seems, therefore, that an enterprise which provides accommodation for holiday-makers is more likely to be a financial success if it is situated near the coast than if it is located further inland.

To sum up, the operation of a caravan site as a supplementary activity to farming can, in certain conditions, provide a useful addition to a farmer's income. The evidence suggests, however, that a small unlicensed site is likely to prove a better proposition than a large licensed one. The definite locational aspects of demand, the relatively short holiday season, and the pronounced peak in numbers of holiday-makers over a very small part of this season, all tend to act as disincentives to the establishment of large-scale, capital-intensive sites, since the risk attached to these will be very high. In contrast, a small site involves the farmer in little or no capital and operating expenditure; therefore the risk attached to the venture is very low.

# Carrot Root Disorders

D. A. Perry

A CONSIGNMENT of carrots sent to a factory for processing whole must yield a high proportion of perfect roots after peeling. Any blemishes on the roots will lower the value of the consignment and, if there are too many, it may have to be rejected by the processor. If a grower had produced mainly small roots to conform with a processor's requirements for whole carrots, he will have no outlet on the ware market and often the roots can only be used for stockfeed.

Fungal diseases such as black rot, violet root rot and liquorice rot, occur occasionally and, although they are present on the roots at harvest, their damaging effects are usually seen only after a crop has been stored for some time. Three root disorders, of which the causes are either unknown or poorly understood, cause more trouble at the factories than any of the fungal diseases. These are called cavity spot, five o'clock shadow and clayburn. There has been considerable confusion about them in the past, and this article is an attempt to define each of these disorders and to summarize the available information on them.

## Cavity spot

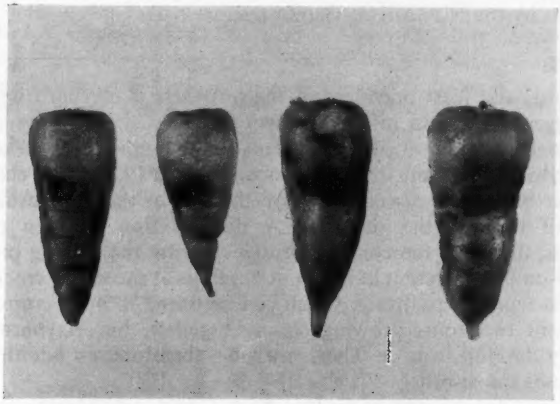
Cavity spot was first described and named in America in 1961 and it is the commonest of the three disorders in Britain. The first signs, which can be seen on fresh roots that have been carefully washed clean of soil, are sunken elliptical depressions up to ¼-inch wide on the side of the roots. The skin is intact, the depression resulting from a collapse of the underlying tissue. There is no marked change of colour at the lesion and no disease organisms are associated with it in the early stages. The lesions enlarge as the roots mature and the skin ruptures, often leaving a ragged edge at the border of the cavity. Fungi and bacteria present in the soil then colonize the exposed root tissues, increasing still further the area and depth of the lesion, which becomes discoloured and corky. At this stage, the lesion may extend halfway round the root. As rotting organisms are already present, affected roots rot rapidly when they are stored after lifting.

In the main carrot-growing areas of England, cavity spot is more serious on peaty than on sandy soils, although in eastern Scotland it occurs chiefly on sandy soils near the coast. The incidence and severity of the disorder increases as the crop matures. This is illustrated by data from an affected field in the county of Angus, where the proportions of blemished roots found in liftings in September, October and November were 6, 15 and 24 per cent respectively.

Work done in America suggested that cavity spot was caused by calcium deficiency which could be induced by excessively high soil potash. However,

analyses of roots from eastern England and from Scotland have so far failed to confirm these results. Experimental work is being continued by the National Agricultural Advisory Service at Cambridge and by the Scottish Horticultural Research Institute, and it is hoped that this will give some indication of the cause. There is some evidence from field trials that Chantenay stocks are much more susceptible than the Autumn King (Flakkee) stocks.

Until more is known about the cause of the disorder, little advice can be given to the farmer who finds cavity spot in his crop. Early harvesting to avoid the later increase is advisable and no attempt should be made to store the crop.



*Fresh roots with cavity spot. On the two left-hand roots the skin over the lesions is unbroken*

## Five o'clock shadow

This disorder, which has an unusual but apt name, has been noted on samples received by the N.A.A.S. at Cambridge since 1958 and has caused considerable trouble in England and Scotland. The symptoms are usually seen only after the roots have been heated in the peeling process and they appear as small, light-to-dark-brown spots scattered on the side of the roots.

*Roots peeled by lye and carborundum, showing typical symptoms of five o'clock shadow*

If the roots have been steam peeled, the spots are raised pegs of hardened tissue. After lye and carborundum peeling, the spots are still visible although the root is smooth. The discoloration extends radially towards the core of the root and cannot always be removed by a second run through the peeling machinery. The spots have been seen occasionally on large, old roots or on those that have been stored, but the discoloration always becomes darker after peeling. As in the case of cavity spot, the disorder becomes worse as the crop matures. It is usually found in roots grown on light, sandy soil and is worst in a dry season.

The cause of five o'clock shadow is not known. A search for a disease organism in a Scottish outbreak failed, and nutritional studies are being carried out by the N.A.A.S. at Cambridge.

## Clayburn

The third, and least prevalent of the disorders is clayburn which, as its name suggests, is found in crops grown in heavy clay soils or soils which contain pockets of clay or silt. It is usually most severe in a wet season. It was first described from roots found in Lincolnshire in 1939 and is characterized by a large, blue-black discoloration on the side of the root, usually on the upper half towards the shoulder. A discoloration is often present on fresh roots, although the colour intensifies during the peeling process. If a discoloration is not present at lifting, it develops at the site of cracked, scurfy areas. This scurfy appearance, which can be found in most crops, probably results from two roots growing closely together, but clayburn does not necessarily develop from it. There must be, therefore, an additional factor which causes the disorder.

Again, no disease organism has been found consistently in clayburn lesions, although the condition can be confused, particularly after peeling, with liquorice rot caused by the fungus *Centrospora acerina*. It has been suggested that the lesions are caused by clay stuck to the side of roots restricting respiration, but this could not be confirmed in Scotland, where the discoloration did not develop beneath adhering clay lumps. In general, a high incidence of clayburn is an indication that the soil is too heavy for carrot production, and any farmer whose crop is affected would be wise to avoid such land in future.

*Clayburn. These roots were peeled in lye but not polished*

## More information is needed

It must be obvious to the reader that our knowledge of these three troublesome disorders of the carrot is scanty but at least they are now well defined, and it can only be a matter of time before more information is available on the causes and possible methods of prevention.

**Acknowledgments**

The material for this article came from a joint discussion at Cambridge with K. V. Cramp (Regional Vegetable Specialist) and E. R. Wallace (Plant Pathologist) of the N.A.A.S., and J. D. Reynolds, Vegetable Section, Trials Branch, N.I.A.B. Investigation of cavity spot and clayburn in Scotland are joint projects with T. G. Rubens, East of Scotland College of Agriculture, and H. J. V. Gledhill, Scottish Horticultural Research Institute, respectively.

---

After post-graduate study at Rothamsted, the author of this article, **D. A. Perry, B.Sc., Ph.D.,** was for four years a pathologist with the Empire Cotton Growing Corporation in Uganda. He then took up his present post as a Senior Scientific Officer in the mycology section of the Scottish Horticultural Research Institute, Invergowrie, where he is concerned with diseases and disorders of vegetable crops, particularly those grown in Scotland for the processing industry.

---

# The Soil Survey

**K. E. Clare**

*Head of the Soil Survey of England and Wales*

---

ALL agriculture is rooted in the soil. As well as being fed from it, man lives on it, moves over it and makes useful things with it. It is the most extensive and enduring natural resource that our small and populous island has, and the best use needs to be made of it. The parables of the seed falling on stony ground, and the collapse of the house on sand, are evidence that man has long appreciated the different values of various soils, and he has continually sought to extend his knowledge. Soil Survey is the contemporary expression of that search.

## Organization

The Soil Survey of England and Wales, now some twenty years old, is an organization supported by money from the Agricultural Research Council. It is administered on behalf of the Council by the Lawes Agricultural Trust, for whom the Director of the Rothamsted Experimental Station exercises

general supervision. The Headquarters Office is at Rothamsted, as are the Survey's Analytical Laboratories and Cartographic Section. Of the forty-seven staff, eighteen are at Headquarters, and the others at thirteen centres throughout the country. The work of the Survey is undertaken regionally, and Regional Soil Survey officers are stationed at Leeds (North), Cardiff (Wales), Wolverhampton (West Midlands), Derby (East Midlands), Cambridge (East Anglia), Bristol (South-West) and Rothamsted (South-East). Centres are also maintained in areas of particular agricultural interest, including Newcastle, Ormskirk (Lancashire), Aberystwyth, Norwich, Exeter and Wye (Kent). The provincial offices are housed in Government buildings, several in close proximity to the National Agricultural Advisory Service.

There is a separate Soil Survey of Scotland, also supported by the A.R.C., with Headquarters at the Macaulay Institute for Soil Research in Aberdeen, and administered as a Department of the Institute. It has a staff of eighteen, and offices are maintained at Thurso, Oban, Forres, Linlithgow and Dumfries. There is, as yet, no formal soil survey organization in Northern Ireland.

Other Government departments make soil surveys for special purposes. Thus the Agricultural Land Service in the Ministry of Agriculture, Fisheries and Food carry out surveys designed to classify land according to its quality in agricultural use, and the Forestry Commission surveys land to be afforested. There is also at least one private soil surveyor who acts as a consultant, and several firms who can supply aerial photographs of value in assessing soil.

## Soil survey

When a soil surveyor starts work in a new area, he first familiarizes himself with the terrain, land use and agricultural and forestry practices. He will visit road and pipe-line cuttings, quarries, gravel- and sand-pits to tentatively, identify the soils and their parent rocks. Later, pits are dug to a depth of 3–5 feet, and records made of what can be seen, felt and inferred over the depth of the soil profile. Depth and colour are recorded for the top soil and for each of the lower layers or 'horizons'. Uniformly coloured horizons suggest well-aerated soil with good internal drainage. Mottling, usually with rust, orange or grey suggests imperfect drainage and a fluctuating water-table, whereas a predominantly grey colour suggests very poor drainage, and a more or less stagnant water-table.

Notes are made of stoniness, worm-holes and root depth; good root distribution suggests good drainage and growing conditions, whereas a hard, impervious pan may offer a barrier to roots. By feeling the moist soil between finger and thumb, a preliminary estimate is made of texture, i.e., the contents of sand, silt or clay, and simple chemical tests indicate the acidity or alkalinity, and the presence of limestone.

Soils with similar profiles are grouped together and regarded as a 'soil series', named from a locality where it is common or was first found, e.g., the Worcester series. Mapping is done by walking across the ground and boring with a simple screw auger (left-hand photograph below) or digging, at intervals, and the soil properties are compared with those in the pits. The position of the boring is then marked on a map, with a symbol indicative of the series. Later, lines are drawn separating the different series; these lines often represent transition zones rather than sharp divisions, because soil types

*Boring with a simple screw auger*

*Mobile drill in operation*

often grade into each other. Where aerial photographs exist these are examined for evidence of soil changes revealed by vegetation or the shade of the land.

To confirm and extend the field observations, samples are taken for analysis from each horizon, either in selected pits or from undisturbed cores obtained by a mobile drill (right-hand photograph on p. 227). In the local or central laboratories of the Survey, precise measurements are then made of texture and of chemical and physical values helpful in assessing fertility. Longitudinal sections are impregnated with a colourless hardening resin and stored in the local office for reference.

## Classification and mapping

The data obtained in the field are recorded by the Surveyor at the local centre and then sent to Headquarters where the tentative classification of the soil is decided, to obtain as much uniformity as possible between surveys in different parts of the country. Up to the present, five major soil groups have been used in Britain. One consists of soils—brown earths—developed under free or moderately free drainage, and a second—gley soils—developed under poor and very poor drainage. Soils in which iron has accumulated beneath a light-coloured layer from which it has been leached (called 'fox-bench soil' in some counties) are termed podzolized soils, after a Russian word, meaning 'white ash soil'. Then there is a large group called calcareous soils, containing calcium carbonate derived from highly calcareous parent materials, such as chalk and other limestones. Finally, soils of which the parent material is peat are grouped as organic soils.

In the Cartographic Department the compiled material is fair drawn, and the draft maps sent to the Ordnance Survey for printing. Hitherto, the main series of maps have been published at a scale of 1 in. to the mile, and seventeen of these exist for areas of agricultural importance in the Midlands, the West and Wales. There are a further fifteen maps for areas in Scotland. Accompanying memoirs describe both soils and their environment, and, where appropriate include sections on agriculture, forestry and other types of land use. Recently, the scope of the work has been extended to the preparation of county maps. Shropshire, Cambridgeshire and Hertfordshire have been surveyed and maps at a scale of approximately 4 miles to the inch are being published for Lancashire, Glamorgan, Monmouthshire and Breconshire. Plans are being made to include all the counties of England and Wales. A survey of the West Midlands region has been published, accompanied by a map at a scale of approximately 10 miles to the inch.

Numerous special surveys have been made in areas of particular interest to agriculture, horticulture and forestry and other industries. For example, maps have been or are being published at a scale of approximately $2\frac{1}{2}$ inches to the mile of the Romney Marsh in Kent, the Sussex Coastal plain and the Middle Teign Valley in Devon. The Breckland in East Anglia and the Brecon Beacons National Park have also been surveyed.

## Research

To support the work of mapping, various scientific problems are studied in both the field and the laboratories, to establish more accurately the characteristics of particular soils. These are concerned with subjects as

various as geomorphology, pedology, soil chemistry, physics, mineralogy and ecology. Particular attention is being given to the possibilities of using aerial photography to speed surveys. New methods of map making are being studied, as well as ways of making the existing maps easier to use.

Research is also done into methods of interpreting soil maps to yield information of direct use in day-to-day problems. Thus, if a map is needed showing the distribution of soil having rock at, say, a depth of 12 inches, it is necessary only to trace from a survey map the boundaries of the series for which this depth is recorded as part of the profile description. Such maps can be derived for any of the properties recorded, e.g., stoniness, gravel or clay at known depth, texture, soil acidity, limestone soils, freely-drained soils, etc. Similarly a contoured topographical map can supply information about slopes and aspect. By combining two or more such derived maps an area of, for example, gently sloping land with a southerly aspect and a moderately acid, sandy-textured, freely-draining soil can be delimited. Access can be added, as well as the proximity to markets, and in this way an attempt made to deduce the possible agricultural or other use of the land. The Survey collaborates closely with the Ministry's Agricultural Land Service and the N.A.A.S. in developing methods of assessing the agricultural capabilities of land. This information is used in advising Local Authorities where land development is the subject of a public inquiry.

## Uses of soil maps

The most general use of any soil survey is that it places on permanent record in map form the distribution of the different kinds of soil. The soil is a most important part of the environment of every individual, and knowledge about it should be part of a good general education. It is therefore not surprising that schools, agricultural colleges and universities are among the largest users of maps.

The Soil Survey in Britain originated with the needs of agricultural advisory work, and the connection is still maintained in that the Survey's offices are often alongside those of the N.A.A.S. The Survey has made maps of all the Experimental Husbandry Farms, as well as the farms of most research centres and agricultural institutes.

Finally, the soil is the most extensive and enduring of the national resources, and needs careful use and conservation. Soil maps help planning at national, regional and county levels to ensure that best use is made of our common inheritance.

---

**K. E. Clare, B.Sc., F.R.I.C.,** is the Head of the Soil Survey of England and Wales. He was previously with the Road Research Laboratory of the Department of Scientific and Industrial Research. His soil research over the past 28 years has included the study of soils in all parts of the World.

---

### BRUCELLOSIS (ACCREDITED HERDS) SCHEME

This scheme sets up a voluntary register of brucellosis accredited herds. It is not an eradication scheme but an essential preliminary to any eradication policy, to enable farmers to buy cattle tested for brucellosis. An immediate eradication policy is impracticable, because it is estimated that about 14 per cent of adult female cattle would react to the tests, in many cases due to vaccination with Strain 19 outside the age limits of the Ministry's free calf vaccination service.

# Cereals in the Common Market

D. R. Silvey

CEREALS play a very important part in the agricultural activities of the Common Market countries. The contribution made by cereals to total sales off farms varies from 5 per cent in the Netherlands to 16 per cent in Italy and averages 11 per cent for the community as a whole, a level similar to our own.[1] However, these figures underestimate the part cereals play in agriculture since they take no account of the contribution made to livestock output by cereals retained and fed on the farm. More illuminating figures are those for the proportion of land under cereals and the total production of grain. For example, in both Britain and the E.E.C. about 45 per cent of arable land is under cereals.

## Production of cereals

Nearly five times as much grain is produced in the Common Market as in this country on rather more than six times the acreage. This is shown in Table 1. Wheat and barley are the most important cereals in the Community, contributing 49 and 21 per cent to total cereal output respectively, followed by oats and maize. In Britain, on the other hand, barley is the most important cereal, contributing 65 per cent of grain output. Average yields of wheat, barley and oats are very much higher in Britain than in the Common Market as a whole.

The percentage contribution made by individual member-countries to total E.E.C. grain output is shown in Table 2. France is the most important grain producer with an output nearly twice as large as either Italy or West Germany. About 46 per cent of the total wheat output and 58 per cent of all the barley is produced in France. There is wide variation in average cereal yields from one country to another. For wheat and barley Italian yields are the lowest and those in Belgium and the Netherlands the highest. Yields of barley in the latter two countries are above the British average.

[1]Some caution must be exercised when comparing figures from different countries since available data are not always of an exactly similar form.

TABLE 1

**Production, acreage and yields by type of cereal***
**(Average of 3 years 1962-64)**

| | *Wheat* | *Barley* | *Oats* | *Maize* | *Rye* | *Other* | *Total* |
|---|---|---|---|---|---|---|---|
| E.E.C. | | | | | | | |
| Total production (million tons) | 27·4 | 11·5 | 6·2 | 6·2 | 4·1 | 0·8† | 56·2 |
| Total production (%) | 48·8 | 20·5 | 11·0 | 11·0 | 7·3 | 1·4† | 100·0 |
| Acres (million) | 25·9 | 9·7 | 6·6 | 5·0 | 3·9 | 0·4† | 51·5 |
| Acres (%) | 50·3 | 18·9 | 12·8 | 9·7 | 7·5 | 0·8† | 100·0 |
| Yield (cwt per acre) | 21·2 | 23·6 | 18·9 | 24·8 | 21·4 | — | — |
| U.K. | | | | | | | |
| Total production (million tons) | 3·5 | 6·6 | 1·5 | — | 0·0 | 0·1‡ | 11·7 |
| Acres (million) | 2·1 | 4·6 | 1·3 | — | 0·0 | 0·1‡ | 8·1 |
| Yield (cwt per acre) | 33·0 | 28·8 | 22·9 | — | 21·7 | — | — |

* Figures are rounded off in all the tables.
† Other cereals, rice, sorghum, etc.
‡ Mixed corn.

TABLE 2

**Production, acreage and yields by country**
**(Average of 3 years 1962-64)**

| | | *Belgium* | *France* | *Italy* | *Lux.* | *N'lands* | *W. Germ.* | *E.E.C.* |
|---|---|---|---|---|---|---|---|---|
| Total production all cereals | (%) | 3·3 | 44·1 | 24·3 | 0·2 | 3·1 | 25·0 | 100·0 |
| Acreage of cereals | (%) | 2·4 | 43·5 | 30·4 | 0·2 | 2·2 | 21·3 | 100·0 |
| Wheat—production | (%) | 3·0 | 45·7 | 31·4 | 0·2 | 2·2 | 17·5 | 100·0 |
| —acreage | (%) | 2·0 | 40·8 | 42·5 | 0·2 | 1·3 | 13·2 | 100·0 |
| —yield (cwt per acre) | | 31·6 | 23·7 | 15·6 | 16·2 | 35·8 | 28·1 | 21·2 |
| Barley—production | (%) | 4·3 | 57·7 | 2·3 | 0·2 | 3·4 | 32·1 | 100·0 |
| —acreage | (%) | 3·3 | 59·8 | 5·2 | 0·2 | 2·4 | 29·1 | 100·0 |
| —yield (cwt per acre) | | 31·0 | 22·7 | 10·6 | 19·6 | 33·0 | 26·0 | 23·6 |

## Imports, exports and consumption

The pattern of trade in cereals in the Common Market is very complex but overall the Community is a net importer of grains. In recent years net imports have averaged about 11 million tons per annum, the difference between total imports of 18 million tons and total exports of 7 million tons. The position for each member country is summarized in Table 3. Only France has a net surplus on trade in grain, amounting to nearly 4 million tons, but even France is not self-sufficient in the production of all types of grain. Hard wheat, for example, is imported for bread-making. Most cereals imported by the Community are for feeding to livestock and maize is a very important item.

Usually, trade in cereals with other members is less important to an individual member-country than trade with non-member countries. For example, 80 per cent of French wheat exports and 55 per cent of barley exports go to non-member countries. Similarly, West Germany, the largest grain importer in the Community, obtains only 14 per cent of her wheat and 30 per cent of her barley imports from other member-countries.

About 27 million tons of wheat are used in the Common Market annually. Consumption of other grain includes 12 million tons of barley, 13 million tons of maize and 8 million tons of oats. Livestock feed accounts for 57 per cent of total grain consumption, and human consumption for 33 per cent; the remaining 10 per cent is used industrially or for seed. Further details of cereal utilization are given in Table 4.

## Policies and prices

In 1962, basic procedures for the gradual establishment of a common market for grains were laid down, and on the 1st of July this year the common market with common prices will become operative. Grain in this context

means soft and hard wheat, rye, barley and maize. The policy adopted for grains conforms with the Community's general agricultural policy, namely the establishment of target prices and of a system which can be used to maintain actual domestic prices near the target levels. In order to do this, threshold (minimum) prices are set for imports. When the most favourable import price, calculated daily in the case of cereals, is below this threshold price the difference is taken as a levy, of which 90 per cent is paid into a central Community fund (the F.E.O.G.A.). At the same time, an intervention (support) price is set, at which member Governments are prepared to accept delivery of the product. Any losses incurred by the Government in disposing of the product, usually by export, are met by payments from the F.E.O.G.A. Intervention prices are usually 7 or 8 per cent below target prices, as shown in Table 5, and, in the past, actual prices have generally been maintained between the target and intervention price levels. There is also a system of Community preference in operation with a reduced levy on cereal imports from member-countries. So far, however, these reductions in levy have been small and probably have had little effect on the pattern of trade.

For the purpose of calculating target prices, which for cereals are always quoted at the wholesale level, the Common Market is divided into several dozen areas of grain surplus or deficiency. The area of greatest deficit, and therefore usually of highest price, is centred on Duisberg in Germany. The basic target price is calculated for this market and used as a starting-point to derive target prices for the centre of each of the main deficit areas in other regions of the Community. From these, target prices are calculated for all the remaining deficit or surplus areas by taking grain transportation costs into account. Grain prices can vary appreciably among these E.E.C. areas. For example, wheat prices in the area of largest surplus (Tours, France) can be 8 per cent lower than in the area of greatest deficit (Duisberg). Seasonal price adjustments to cover storage costs are another feature of the price system.

The prices for 1962–63 and 1965–66, shown in Table 5, illustrate the charges which have been necessary in individual countries as prices are brought into line throughout the Community. At the beginning of the period there was a great deal of variation in price levels between countries. Soft wheat prices were high in West Germany and Italy, low in France and the Netherlands. Feed-grain prices were high in West Germany, moderate in France and the Netherlands, and low in Italy. The basic target wholesale price for Duisberg announced for 1967–68 is nearly £39 per ton for soft wheat and rather more than £33 per ton for barley and maize. Intervention prices are £36 and £31 respectively. Even allowing for the fact that actual average wholesale prices are likely to be perhaps 6 to 8 per cent below the basic target price at Duisberg, the price levels are high by British standards.[1]

---

1. Actual *producer* prices are likely to be lower than the basic target price at Duisberg for three main reasons.
   (*a*) Prices at Duisberg will be at the upper end of the range of regional prices. Assuming average prices to be at the mid-point of this range, they will be about 4 per cent lower than at Duisberg.
   (*b*) If actual prices are maintained mid-way between the target and prices, they are likely to be 3 or 4 per cent below the target price.
   (*c*) The prices for grain at Duisberg are wholesale and include handling costs and dealers' margins.

TABLE 3

**Imports and exports***
**(Average of 3 years 1962-64)**

| | *Belgium-Lux.* | *France* | *Italy* | *Nether-lands* | *West Germany* | *E.E.C.* |
|---|---|---|---|---|---|---|
| | | | (million tons) | | | |
| Total exports, all cereals | 0·3 | 5·1 | 0·4 | 0·4 | 1·1 | 7·3† |
| Total imports, all cereals | 2·3 | 1·3 | 4·4 | 4·0 | 6·0 | 18·0† |
| Net trade | −2·0 | +3·8 | −4·0 | −3·6 | −4·9 | −10·7 |
| Wheat—exports | 0·2 | 2·9 | 0·2 | 0·1 | 0·8 | 4·2† |
| —imports | 0·5 | 0·6 | 0·4 | 0·8 | 2·1 | 4·4† |
| —net trade | −0·3 | +2·3 | −0·2 | −0·7 | −1·3 | −0·2 |
| Barley—exports | 0·0 | 1·7 | — | 0·2 | 0·0 | 1·9† |
| —imports | 0·3 | 0·1 | 0·6 | 0·2 | 1·3 | 2·5† |
| —net trade | −0·3 | +1·6 | −0·6 | −0·0 | −1·3 | −0·6 |

* Including wheat flour as wheat equivalents.
† Including trade between member countries.

TABLE 4

**Utilization of cereals in the Common Market**
**(% 1964-65)**

| | *All cereals* | *Wheat* | *Barley* |
|---|---|---|---|
| Livestock feed | 57·0 | 20·1 | 71·4 |
| Human consumption | 32·7 | 72·7 | 1·2 |
| Industrial purposes | 5·4 | 0·3 | 22·1 |
| Seed | 4·9 | 6·9 | 5·3 |
| | 100·0 | 100·0 | 100·0 |

TABLE 5

**Target and intervention prices for grain at wholesale level***
**(£ per ton)**

| | *Soft Wheat* | | *Barley* | | *Maize* | |
|---|---|---|---|---|---|---|
| Country and Period | Target | Intervention | Target | Intervention | Target | Intervention |
| Belgium | | | | | | |
| 1962–63† | 38·8 | 36·1 | 31·6 | 29·4 | — | — |
| 1965–66 | 39·6 | 36·8 | 33·3 | 31·0 | — | — |
| France | | | | | | |
| 1962–63 | 35·5 | 32·8 | 28·9 | 26·7 | 32·3 | 30·4 |
| 1965–66 | 37·0 | 34·3 | 30·7 | 28·5 | 32·8 | 30·4 |
| Italy | | | | | | |
| 1962–63 | 40·3 | 38·0 | 24·2 | — | 23·9 | — |
| 1965–66 | 40·9 | 38·4 | 25·1 | 23·2 | 25·8 | 22·7 |
| Netherlands | | | | | | |
| 1962–63† | 35·1 | 32·8 | 28·9 | — | — | — |
| 1965–66 | 39·6 | 37·2 | 33·4 | 30·1 | — | — |
| West Germany | | | | | | |
| 1962–63† | 44·1 | 41·8 | 37·4 | 35·5 | — | — |
| 1965–66 | 43·9 | 41·6 | 37·0 | 35·1 | — | — |

* Prices quoted are the mid-points of the range.
† National quality standards, not corresponding with those of the E.E.C., were current at this date.

Special arrangements have been made for some cereals; for example, since durum wheat is in short supply in the Community, a guaranteed price is being given to producers in order to encourage domestic production. Any necessary deficiency payments will be made from the F.E.O.G.A. and the degree of self-sufficiency should be increased without appreciably affecting internal market prices.

Temporary relief measures are permissible in countries where prices for certain types of grain have been very low or very high. Italy, for example, has a tradition of very low prices for coarse grains and for these products a five-year extension of the transitional period has been granted. At the end of this extension period Italian price levels for all cereals will be similar to those prevailing in the rest of the Community. In contrast to coarse grain prices, wheat prices in Italy have been high, as have the prices of all cereals in West Germany and Luxembourg. For three years these three countries are to be granted compensatory payments from the F.E.O.G.A. These payments will enable the respective Governments to phase-out the effect of reductions in producer prices over a longer period.

## The future outlook

Cereal prices in the Community are high by any standards. At the present stage of development of the Community, the considerable political and social pressures which generated these high prices are likely to continue and they will probably remain high in the short run. Many developments tend to favour increased production, particularly in France, the largest producer. Cereal prices there have risen appreciably and current possibilities for technological improvement (as in other member countries) are still not fully exploited. Though many factors other than price are involved and do not always favour increased output, grain production in the Community is likely to continue to increase over the next few years. So far, the increases in production of grain have kept more or less in step with increases in total demand. Over the next few years, net cereal imports are likely to continue at much the same level as in the recent past and the impact of the E.E.C. on world markets is unlikely to change appreciably. However, in the long run, maintenance of high price levels within the Community could cause large increases in production and reduce net imports considerably. The demands made upon the F.E.O.G.A. in order to maintain internal price levels could be considerable. Embarrassingly large payments by the exchequers of the member-countries might be necessary. If such a situation were developing, appropriate remedial steps would no doubt be considered, including the reduction of price levels.

---

This article has been contributed by **D. R. Silvey, B.Sc. (Hons.), Dip.Agric. Econ.,** who is a Research Officer in the Farm Economics Branch of the School of Agriculture, Cambridge.

---

# The Ministry's Publications

Since the list published in the April, 1967, issue of *Agriculture* (p. 197) the following publications have been issued.

*Advisory leaflets which have previously been priced at 4d. each will in future be obtainable free of charge from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.*

ADVISORY LEAFLETS

No. 169. The House Sparrow (Revised)

No. 260. The Common Buzzard (Revised)

No. 365. Houseflies, Blowflies and Cluster flies (Revised)

No. 404. Heating of Grain in Store (Revised)

No. 534. The Rabbit (New)

SHORT TERM LEAFLETS (*free issue*)

No. 19. Choosing Selective Weed-killers for use on Cereals in the Spring (Revised)

No. 29. Choosing Selective Weed-killers for Annual Weeds in Root Crops (Revised)

No. 52. Suggestions for Chemical Weed Control in Vegetables 1966–67 (New)

No. 57. Buildings for the Single-suckled herd (New)

No. 62. Brussels sprouts for Single-pick Harvest (New)

# Pipeline Feeding of Pigs

**Hector Fraser**

WITH the ever-increasing need to economize in labour costs, attention is turning to the mechanization of pig feeding. There are, of course, mechanical systems of dry feeding, and there are, broadly, three different categories of pipeline feeding. Firstly, systems where only the liquid is piped: some of these have been in existence for many years and need only brief mention. Secondly, the increasingly popular system by which meal and liquid are mixed together and distributed by pipeline to the pigs. Thirdly, swill systems, which are often adaptations of the second system.

## Equipment

Where only the liquid part of the food is piped to the pigs, as, for example, skimmed milk or whey, only small-bore pipes are needed. A gravitational supply or a relatively small pump are normally quite adequate. The size of the pump will depend on the length of pipe, the relative heights of the liquid store and the pipeline feed points. Mixing the meal with the liquid increases the consistency of the feed; consequently, pumps of greater capacity and larger-bore pipes are required. Most units in this category consist of a mixing tank, the capacity of which will obviously vary but is usually between 250 and 1,250 gallons. The shape of the tank is generally cylindrical, with the bottom sloping towards the centre to eliminate sedimentation of the meal. Agitation is most commonly achieved by a centrally-rotating shaft carrying paddles or an auger, the agitation spindle being driven by a small electric motor of between 3 and 7 h.p., depending on the size of the unit and the consistency of the mix. Some by-product foods require the stronger motors. Agitation by re-circulation only is sometimes used on the smaller units, in some of which the tank is semi-circular and lies horizontally.

A centrifugal pump with a two-inch diameter outlet capable of 10,000 g.p.h. at 60 ft head, is coupled to the mixing tank. Because the pump is

placed below the mixer, it is self-priming. The mix can be re-circulated to the tank or pumped from the tank along the pipeline to the piggeries. The pump can also draw water directly, either to the mixing tank or the pipeline. It is driven by a 7½ to 10 h.p. electric motor, the capacity of which will depend on the rate of flow required, the consistency of the mix, the number of bends in the pipe, the length of the pipeline, and the relative height of the feeding points to the unit. The pipeline is usually of black iron or P.V.C., 2 in. or 3 in. in diameter with 1½ or 2 inch lever-action gate valves to the troughs. Where fixed pipes and valves are fitted to each trough, the delivery pipe is best arranged at an oblique angle to the trough to avoid splashing

*Pipeline mixing plant with pump unit at centre bottom. Dry mixer on the right which was in existence before the wet mixer*

and to facilitate level delivery. In long troughs more than one feed point may be necessary to prevent fighting and bullying. A flexible delivery hose from one valve can be used to fill the troughs more evenly and to fill more than one trough, thus reducing the number of gate valves and the cost of the installation. When installing a pipeline system to handle by-products containing dilute acids (e.g., whey) care should be taken to avoid using materials liable to corrosion, such as galvanized metal and cast iron. The rotor of the pump should be of phosphor-bronze or other resistant material in such cases. In some big swill feeding units the swill is stored in large concrete tanks. Heavy sewage type pumps are employed and, depending on the materials in the swill, different types of choppers and grinders are used to reduce the multifarious material to a uniform condition capable of passing through the pipelines and valves.

If there is severe frost, the freezing of the mix in the system can be a hazard. In new piggeries the pipe can be completely buried and stand-pipes to the troughs installed. Draining the pipeline after feeding, particularly after the evening meal, will effectively prevent damage but it should be remembered that the pump may still contain water. Vertical piping, especially where pumping down, should be avoided if possible, to minimize choking of the pipe due to the settling out of the meal. For the same reason slow bends are

preferred to right-angled bends. It is worth considering the incorporation of sweep T bends with plugs, to allow for rodding should this be necessary.

## Food efficiency

There is an obvious dearth of experimental work on pipeline feeding itself, but there is a fund of experimental knowledge which can reasonably be related to it. This, together with the opinions and experience of the increasing numbers of practical feeders who are using pipeline systems, provides a quite reliable guide for comparison with the more conventional systems of feeding. When fattening pigs are fed their meal dry and their water separately, the days to slaughter can be expected to be from seven to ten days longer than with similar pigs fed the same amount of the same meal mixed with water in the trough. Also, a poorer conversion rate can be expected to the extent of 0·1 to 0·2 lb of meal per lb liveweight gain. In some cases the killing-out percentage and carcass quality have been influenced by wet feeding, but on the whole there appears to be little difference. The quantity of meal per gallon of water can affect the efficiency of the feed, particularly at the extreme ends of the scale, by depressing the intake of meal when the mix is too wet and, to a lesser extent, restricting consumption because of insufficient water when the meal is too dry. The range indicated is between 2 lb and 4½ lb of meal to 1 gallon of water. One feeder maintains that 5 lb per gallon improved his grading but this may be due to the automatic restriction of intake imposed on the pigs. A practical consideration here is that the mix is rather thick and does not run along the trough very well. This does not matter when the existing troughs have swing fronts or when flexible delivery piping is used, but it does, of course, mean that the rate of flow is slow and that blockages can occur more easily. Within the range of 2½ to 4½ lb of meal to the gallon of water, opinions and results vary. It will help the pigman to decide the consistency of the mix if he observes the consistency of the dung. If it is not firm enough, thickening the wet feed can result in firming the dung, and vice versa, but care should be taken to avoid high dilution rates.

It is accepted that young pigs of up to about 100 to 120 lb live weight require a lower proportion of water than older pigs. Where young pigs are on a pipeline system, it may be advisable to supplement with a dry feed. The same may be necessary for sows.

With most wet mix systems it is possible to pre-soak the meal by mixing immediately after feeding and leaving it to soak until the next feed. Where the troughs in the piggeries have shutters, the time of soaking can be extended to nearly 24 hours by filling them immediately after a feed with soaked meal which will lie in the trough until the next feed. There are feeders who favour pre-soaking the meal and allowing some fermentation to take place. The type of fermentation can affect the palatibility of the food. For example, when whey or skimmed milk is fed, the dominant fermenting organism can be of the type that produces lactic acid and so the palatability of the food will not be adversely affected. In fact the production of lactic acid can inhibit the growth of undesirable organisms. It is suggested by some that soaking increases the digestibility of the food. On the other hand, it is argued that soaking may lower the energy value of the food because of the activity of micro-organisms, and that the value of certain ingredients such as vitamins and essential amino acids may be impaired. In practice, it is doubtful if the loss of energy due to fermentation is significant. A very small amount of fermenting sugar can produce what appears to be a prodigious amount of

gas in the form of froth in a tank. In one case the amount of frothing was sufficient to overflow the tank and have the mix running out through the door of the meal house. The loss due to the physical spillage was obvious and far outweighed any loss caused by fermentation. If fermentation should be desirable, which is doubtful, the right kind of fermentation would have to be produced by controlling the temperature, the source of the organisms and the time of fermentation. All of this is left to chance in most of the units

*Flexible pipeline of adequate length to minimize splash. By reaching the full length of troughs it reduces crushing and bruising*

where soaking is being practised. In some cases undesirable fermentation appears to have resulted from the use of heated water.

The more common practice is to mix and feed right away, and at our present state of knowledge this is perhaps the better system to adopt. It is essential to avoid spoilage and souring by keeping the equipment as clean as possible. In practice, this means re-charging the mixing tank with water which has been circulated round the pipeline to flush out all the meal, and doing this as frequently as is necessary to prevent a build-up of undesirable organisms. It is, in fact, possible to inhibit bacterial and mould growth by the addition of formalin (0·1 per cent of the mix). This does not impair the palatability of the food. In conjunction with thorough cleaning and flushing of the system, the addition of formalin should overcome trouble due to undesirable decomposition.

## Health

Claims are made that the health of the pigs is better on pipeline feeding. In quite a number of cases where dry meal feeding was practised there certainly appears to have been a reduction in the incidence of scour and in respiratory disorders after the change. When introducing young pigs to wet feed, however, care should be taken to avoid inducing scour by too liberal a proportion of cold water in the mix.

## Labour

The cost of labour today is about 5*s*. 6*d*. an hour, and in the not-too-distant future it may well rise to at least 10*s*. an hour. In fact, the top stockmen of today are already well on the way to getting this figure. The farmer with an eye to the future must investigate techniques that will allow the highly-skilled man to look after more pigs and give him more time for stockmanship. Humping bags of dusty meal and pushing slopping barrows of swill is not stockmanship, nor does it create conditions to attract the right kind of men into the much-maligned occupation of pig keeping.

There are many reports from pig keepers who have installed pipeline feeding of time saved in feeding pigs and of the improvement in conditions brought about by the reduction of dust, to the benefit no doubt of both the operator and the animals. A work study analysis was carried out on a farm in Yorkshire by J. H. Clift, of the N.A.A.S., to compare the labour requirements before and after installation of a pipeline system. This farm was a very suitable choice for the exercise, as the standard of pig husbandry was already good under the old system and there were three different feeding methods due to differences in housing. The building layout, the livestock policy and the frequency of feeding remained the same after the change. In a fattening house with slatted dunging passage, pigs were 'floor fed' with a home-mixed dry meal dispensed by hand. In a Danish-type house, pigs were trough-fed the same formula of dry meal added to water, both dispensed by hand. In another set of buildings, originally intended for swill-feeding, the pigs received the same meal mixture after it had been mixed with water in a swill tank and dispensed from a hand-pushed swill-barrow to the troughs.

Taken over the three buildings, but excluding the time required to mill and mix, the labour needed for feeding with the pipeline system was one-third of the previous requirement. Looking at individual methods, the greatest reduction in labour was brought about by the change in the Danish house (less than one-sixth of the former labour). There was also a great saving in labour in the 'swill system' (less than one-quarter of the former labour). In the slatted-floor house, the labour requirement was virtually the same as it had been when feeding on-the-floor. However, even with the slatted house, the manual work of lifting up and carrying meal sacks was eliminated, whilst with the pipeline feeding in the Danish house, there was now no meal barrow to push. With the original 'swill system', meal sacks had to be delivered by tractor and workers. This was also eliminated by the pipeline. It should be added that the worker no longer had to sack-off five or six tons of meal per week from the mixer into sacks to place aside, only to have to pick them up again either for transport by tractor or to be carried individually to the feeding points.

The above example is quoted as factual confirmation of the many statements from feeders who have experienced just as good, or even better economies. It should also serve as a warning that the installation of a pipeline is not necessarily going to solve everybody's labour problems, as instanced in the case of the floor-fed house. Not only was there no improvement in the time taken to do the job, but in such a house most feeders would have to instal troughs. This would involve more expense and reduce the accommodation for pigs. At least one feeder is known to be feeding pigs on-the-floor with wet mix from a pipeline, but whether this is advisable or not is open to debate. In the case of the swill feeder, of course, the pipeline system can only

be appraised in relation to the labour requirement and improvement of working conditions. No information is available on the effect of the pipeline system on efficiency of conversion, in relation to swill feeding.

## Costs and returns

The simplest, and possibly the cheapest, system is where the mixing unit can be placed below the level of the troughs and where the troughs can be continuous. The mix is pumped to the highest point of the trough and flows down the trough, the surplus returning to the mixer. Obviously, this system has limited application. The more common system will cost between ten shillings and five pounds per pig place, depending on the size of the unit, the number of feed points, the amount of alteration and adaptation in the case of existing buildings, the amount of piping and the number of pigs to be fed. In the example already quoted, where there is accommodation for 400 pigs, the cost was approximately £2 per pig place. After the installation of the pipeline, the labour requirement for feeding was reduced from twelve hours to four hours per week. A reduction of eight hours per week represents a saving of about £114 per year. Provided that the time saved can, in fact, be profitably utilized, this will go a long way towards justifying the expenditure of approximately £800. If there is also an improvement in conversion rate, a further economy can be expected. An improvement in the conversion rate of 0·1 lb per lb liveweight gain in a fattening house with a throughput of 2 to 2½ batches per year, is equal to a saving of about 7*s.* 6*d.* per pig place. The effect of wet mix on conversion rates has already been indicated and depends largely on the system of feeding practised beforehand.

## The future

It is quite possible to feed pigs by a completely automatic system, and although most of the existing plants are manually operated, a few have installed automatic controls. A method which is proving satisfactory employs compressed air operating diaphragm valves which open and shut the feed point valves. The amount of wet mix delivered to each pen is controlled by a variable time switch. Such a system brings accuracy of rationing to pipeline feeding. Automation can also be used to control the handling of all the feedingstuffs from the point of delivery on the farm to the pig. It must be stressed, however, that the skill and attention of the good stockman cannot be automated, and without him all the sophistication of equipment would be of no avail. Indeed, the pipeline system of feeding calls for a high standard of stockmanship if efficiency is to be assured.

---

This article has been contributed by **Hector Fraser, N.D.A.,** who is a Livestock Husbandry Adviser in the Yorks. and Lancs. Region of the N.A.A.S. Mr. Fraser was previously Farm Manager of 2,000 acres in Gloucestershire and before that served in a similar capacity in Scotland with the Animal Breeding Research Organisation.

---

**TAX IN PERSPECTIVE**

This series will be resumed in Agriculture shortly

---

# Disposal of Farm Effluent

**Public Health** **S. T. G. Gray**

THE old country saying 'Where there's muck there's money' brings to mind a picture of factory chimneys belching smoke and grit into the atmosphere rather than a rural scene of waste material being spread on agricultural land. Yet, in livestock farming today the two factors are just as inseparable, though perhaps 'Where there's money there's muck' might be more appropriate! In some of the more intensive operations the application of muck to the land has become less a matter of land treatment and more a means of disposal of the often embarrassing accumulations arising from the enterprises.

## The problem

The farmer has lived in harmony with his neighbours for many years; the annual muck spreading operation, although it occasionally filled the village air with pungent and penetrating odours, was as expected and accepted as spring itself. Pollution of the roadside ditches by cowshed washings was also regarded as inevitable; it was often accompanied by sullage water from the cottages, anyway.

In recent years the farmers' neighbours have consisted less of persons associated with the land and more of those earning their living in business and industry; many thousands are prepared to commute considerable distances to enjoy living in the country. Often such people have little or no knowledge of agriculture; their reactions, when they discover the 'delights', which they have gone to such trouble and expense to obtain, include the odour from either an intensive pig or poultry holding, or the adjacent ditch polluted by silage percolate, are hardly surprising.

To keep the problem in perspective, however, we must realize that the nuisances mentioned above are not really the same as those accepted in the past, neither is it only the newcomers to the country who are affected. In recent investigations in East Suffolk farmers and farm workers have agreed that the smells from intensive operations are quite unlike traditional rural odours. In more than one instance poultry farmers have readily agreed to return to a dry system of manure disposal; one explained that he could not stand the smells himself and had no desire to inflict them on his neighbours.

The old established and accepted methods of disposal of manure cause little or no trouble to the populace, and only in exceptional circumstances would nuisances arise from this operation which might be considered public nuisances actionable by local authorities under the Public Health Acts. Over the last few years, however, many complaints have been received in connection with disposal of effluent from intensive enterprises. Few people would argue that the slurry effluent constantly churned out from intensive pig and

poultry holdings does not carry a strong and most unpleasant odour; and whatever the method of disposal a potential nuisance risk must be acknowledged. Cases have been investigated where for periods houses are affected by odours of such operations and people are unable to open windows or use their gardens in summer time. Washing hanging in gardens has been soiled by drift from sprays. Is it surprising that people thus affected dislike such interference with their personal comfort and living conditions?

Increased activity in the field of rural sewerage schemes has reduced the pollution of ditches and where nuisances arise in this way they are all the more conspicuous. People are generally more enlightened on such matters as flies and their connection with food poisoning and are not so tolerant of unsatisfactory conditions. The high incidence of Salmonella organisms in food animals is well known. Such organisms may survive for considerable periods in manure and, although to the best of my knowledge they have not been isolated from spray drift, the possibility of food poisoning bacteria being conveyed to man cannot be ignored.

## Practical solutions

Despite the availability of excellent inorganic fertilizers there is still a feeling that, where possible, organic wastes should be returned to the land. The trend towards composting in the field of domestic refuse is noticeable and the use of pulverized refuse on land is an indication that the value of organic wastes has not been entirely forgotten. In general it is accepted that the most satisfactory disposal of farm effluents is to return them to the soil.

The main concern in Local Government is that farm effluents should be disposed of so as not to give rise to nuisance or conditions prejudicial to health. I shall not presume in this article to tell you how; the advice of the Ministry's technical officers is at your disposal and expert articles on this aspect appear from time to time in this journal. My observations are limited therefore to commenting briefly on the various solutions or palliative measures available in the light of experience of investigating such problems as are brought to the notice of public health authorities.

Clearly one's first observation is on the matters of siting and planning. A little forethought on the system of manure disposal, proximity of dwellings and the direction of the prevailing wind before erecting the houses or slurry tanks may save the neighbours considerable discomfort and the farmer a great deal of bad feeling, official inquiries and possibly expense.

If it is decided to adopt a wet or slurry system, then it is important to ensure that the tanks are of sufficient capacity so as to be able to avoid spraying in unsuitable weather conditions, and to ensure that the wind is in the right quarter when the tanks are emptied and the slurry is deposited on the land. Alternatively, emptying should be carried out so frequently as to prevent the slurry becoming septic.

On a permanent or long-term basis, the disposal of poultry manure by the use of drying plants has much to commend it. This type of operation is comparatively new, however, and the possibility of nuisances from odour cannot be overlooked; although research is proceeding on the deodorizing of the gases evolved, unless the site is isolated it is perhaps wise to proceed cautiously. It is understood that recent trials with the use of potassium permanganate have shown promising results and this system may provide a

complete answer in the very near future. The idea of manure treatment at source by the open ditch method may ultimately provide the answer to the problem in intensive pig holdings. However, the system, well known to public health officers as the 'Pasveer' ditch, needs careful control and at this stage experimentation should only be carried out in carefully selected sites.

Users seem either to swear by or swear at deodorizing chemicals. The use of chemical additives to slurry can be quite expensive; sometimes this may give rise to underdosing with unsatisfactory results and ultimate maligning of the product. If this method is to be adopted it is essential to comply with the makers' instructions both in respect of dose and time of application. Half-measures can result only in waste of time and money; unless the reduction in odour is significant the improvement will not be appreciated. The use of a deodorant spray barrier is becoming more popular and this method seems to have answered several problems. The system can now be used on a mobile basis as portable equipment is available. Often such installations make use of a weather vane switch so that the spray is used only when the wind direction is within a certain arc.

Farm effluent may now be considered a 'trade effluent' and as such may be accepted into a public sewer at such cost and under such conditions (within certain broad limits) as the local authority may determine. This, however, is not likely to be a practicable method of intensive farm waste disposal except in rare circumstances. It might, however, provide the solutions to some effluent problems and should not be overlooked when considering dairy washings and similar wastes where a public sewer is available.

Obviously, every problem will need to be judged individually and it is clearly up to the farmer and his advisers to choose the best one for his needs.

## Public Health legislation

The nuisance provisions of the Public Health Act 1936 are applicable to nuisances or unsatifactory conditions arising from farm effluents. When considering this legislation one important point to realize is that a 'nuisance' is not necessarily something which directly affects health; it is sufficient that it interferes with personal comfort.

'Statutory Nuisances' are defined in the Act, and include:

1. any premises in such a state as to be prejudicial to health or a nuisance;
2. any animal kept in such a place or manner as to be prejudicial to health or a nuisance;
3. any accumulation or deposit which is prejudicial to health or a nuisance;
4. any dust or effluvia caused by any trade, business, manufacture or process and being prejudicial to the health of, or a nuisance to, the inhabitants of the neighbourhood.

In proceedings under (3) above it is a defence to prove that the accumulation or deposit is necessary for the effectual carrying on of the business and had not been kept longer than necessary. In (3) and (4) it is a defence to prove that the best practicable means have been taken to prevent or counteract the effect. No such defence applies, however, in (2). If it is accepted that there are no other means of preventing the nuisance the only action that can be taken is to keep the animals in some other place or manner. The word effluvia is not defined in the Act; one dictionary definition is a 'noxious emanation' which seems to cover the odorous gases given off from septic farm effluents.

Where a local authority are satisfied of the existence of a 'Statutory Nuisance' they shall serve a notice on the person by whose act, default or sufferance the nuisance arises or continues, requiring him to abate the nuisance and to execute such works and take such steps as may be necessary for that purpose. This last sentence is quoted, with very slight omissions, from the Act; it will be seen that the local authority, once satisfied of the existence of a nuisance have no option but to serve the notice.

Paraphrasing the next section of the Act—should the person fail to comply with the notice, or if a nuisance, although abated, is likely to recur, the authority shall lay information and the person will be required to appear before a court. In turn, if the court is satisfied of the existence of a nuisance it shall make an order requiring the defendant to comply with the requirements of the notice and may also at this stage impose a fine. Attention is drawn to the use of the word 'shall'; this, the law books point out, is imperative and imposes a duty.

## Planning legislation

Agricultural holdings have exemption from normal planning control of the erection of buildings provided they are at least 80 ft from a trunk or classified road and do not exceed 5,000 sq. ft alone, or in conjunction with other buildings within 100 ft erected within two years. This exemption I understand applies also to the construction of slurry tanks. This concession does not apply to industry in general and the question is often asked why agriculture should be so favoured when other industries are controlled and sometimes delayed by planning procedures. In the past farmers and landowners have not misused this privilege, possibly through their desire to maintain an attractive appearance in the countryside. Whatever the reason, I feel it would be unfortunate in the extreme should this concession be ultimately lost to agriculture through abuse by a few.

## Conclusion

In general, public health officers in rural areas are sympathetic towards the farmer and appreciate his difficulties. It would often be of mutual advantage to discuss means of effluent disposal with the local public health inspector. Wherever the sympathies of a rural authority may lie when satisfied of the existence of a statutory nuisance, their duty is clear—and it is to the public as a whole.

It seems essential, at this time, for the farmer, adviser and public health officer to keep abreast of developments which provide the best possible means of disposal of farm effluents of all kinds and thereby reduce or eliminate nuisances and conditions prejudicial to health.

---

This article in the series on the disposal of farm effluent has been contributed by **Dr. S. T. G. Gray, M.B., Ch.B., D.P.H.,** who is the County Medical Officer of Health and the Principal School Medical Officer for East Suffolk. He has been in Public Health since 1937 and worked in West Suffolk and Norfolk before coming to East Suffolk. The views Dr. Gray expresses are his own and not necessarily those of East Suffolk County Council, nor, of course, those of the Ministry of Agriculture, Fisheries and Food.

# 52. Scarborough, Yorkshire

**K. M. Thompson**

SCARBOROUGH, ancient North Riding stronghold of Viking invader Skarthi, today the playground of Yorkshire, is an exciting mixture of ancient and modern. The town, however, dates much further back than the Danish settlement. On Castle Hill the remains of a bronze age settlement dates the community back to the fifth century B.C. Overlying these remains is evidence of a Roman signal station, on which stands the most recent edifice dating from about 1100, the castle ruins. These tower over the houses of fishermen and one-time smugglers.

To the south and west lies the Vale of Pickering, a wide valley bounded by the chalk and flint wolds of the East Riding in the south, and the 'Tabular Hills' to the north. The Vale, in ancient days a lake, is mainly lacustrine clay, with areas of sand, gravel and deep peat. The river Derwent rises in the hills, passes within a mile of the sea at Hackness, falls swiftly to Ayton, suddenly turns inland and slowly meanders through the Vale to Malton, contained on either side by double flood banks.

The level of the Derwent is controlled by a sluice at Hackness, diverting flood water along the 'Sea Cut', a man-made channel discharging at Scalby Mills, the northern end of Scarborough promenade, and relieving the pressure on the flood banks to the west. To the east, however, drainage is the problem; the majority of the lowland is peat running out to the coastal strip of boulder clay. Internal Drainage Board ditches intersect the fields, slowly discharging into the river Hertford, a tributary of the Derwent. In this valley basin falls are slight, the water table high, so grass predominates, the arable being restricted to the higher areas of peat and surrounding clays, sands and gravels. If the drainage could be sufficiently improved by pumping, this carr land might develop into another Fen country.

Running due west, the main A.170 follows the edge of the ancient lake, revealing a perfect view of the Vale in the foreground, merging into the Wolds rising to the south. Arable farming is the keynote, with cash roots, potatoes and sugar beet on the sands and gravels, but grass as the break crop on the areas of heavier clay. A massive silo recently built just over the county boundary at Knapton handles malting barley, mainly from the East Riding, but taking considerable quantities from the Vale of Pickering. Recently, there has been a growing trade in the export of local barley from Scarborough to the Continent.

The size of farm varies greatly, from 600 acres down to smallholdings of 20 acres, with the majority about 200 acres. Dairying occupies most of the

smaller farms, as the returns per acre from arable and other livestock are too small to give a reasonable standard of living on farms of this size.

The larger dairy farms are concentrated to the east of the district. This is an intensive grassland area with cows mainly housed in yards and fed on silage, but varying in housing from kennels to cowhouses, and in feeding from straw and concentrate systems to haylage and barley. The Friesian has almost completely replaced the Shorthorn and Ayrshire, but despite the Northern climes, the herds of Guernseys and Jerseys appear to be increasing.

Sheep and beef cattle are restricted to the larger arable farms in the Vale of Pickering. Flocks of 'half-bred type' ewes produce fat lambs off mainly summer grass, but throughout the winter fattening lambs are to be found folded on roots. Traditional two to two-and-a-half year old beef is still produced but the trend toward fattening in yards after one summer grazing is very noticeable.

To the north of the Vale the land rises, changing in geology and topography to the 'Tabular Hills'. There is a predominance of coralline oolite and calcareous sandstone with a distinct belt of Oxford clay running through it. Large areas of corn are gashed by steep dales, too steep in many places for a tractor, so the balance of cereal and livestock has not altered as greatly as on the plateau to the north. This plateau extends north to the 70,000 acres of the North East Yorkshire Moors, a sparsely populated area which presents a bleak desolate picture, except in the short summer period when the heather is in bloom.

Dominating the moorland scene on the Pickering/Whitby road are the ever-watchful eyes of our defence—'Fylingdales Early Warning Station'—an alien-looking settlement with its three great honeycombed radar domes, locally nicknamed 'golf balls'.

Though the area looks unproductive on the surface, great excitement exists in the moor edge villages. What of Texas now? As yet no black gold has spurted from 'them thar hills' but they have provided one of the most promising strikes of natural gas yet made in the 'North East Search'.

Alongside the oil men and the afforestors, farming pioneers have penetrated the moor, the heather giving place to grass, heavily stocked with dairy and beef cattle, together with the half-bred ewe. The productivity of this land can be greatly increased provided there is capital and know-how available.

An account of Scarborough District would not be complete without mentioning the forests. The Commission has some 25,000 acres of land, about 10,000 of which is planted mainly with conifers. This has greatly changed farming in the area. Hill sheep have almost been wiped out in the south of the Moors, but the Moor area to the north extending to Whitby has more than its fair share of sheep problems, which have triggered-off an intensive investigation of hill sheep farming.

The Forestry Commission has planted up many farms, but in many ways has added to the amenity value of the National Park. The 'Forest Drive' from Bickley to Thornton-le-Dale opens up to all the opportunities of exploring areas of beauty only seen before by the most ardent hikers and ramblers. In addition, many walking routes are provided, with printed guides naming trees and places of interest, catering for those who are prepared to venture forth from their cars.

An area rich in variety of historical, geographical, scenic and farming interest, it holds attractions for all comers. The claim of Scarborough resort with its twin bays to be 'Queen of the Yorkshire Coast' is well founded.

# Handling Sheep on the Hill Farm

**J. R. Mathias**
*Agricultural Land Service, Durham*

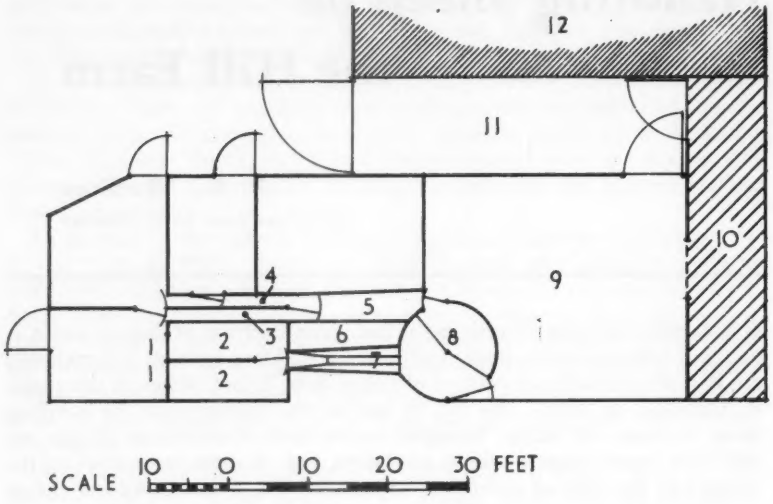
IT HAS been said that all progress is but a continuation of history and it is certainly true that many modern advances in building methods and materials are in essence simply a repetition of things done before, although there may be variations in detail. This can be said of the arrangements for handling sheep on many hill farms. Examples on the lines of traditional layouts are still to be found where marking, castration, and, in some cases, docking the lambs and the dipping operations are carried out in some outlying corner away from the homestead. Shearing is more often done at the homestead, which is convenient for feeding extra workers and for storing the wool. True, dipping and shearing need not take place at the same time, and dipping is no longer compulsory against sheep scab, but it is still common practice on many farms to control strike by maggot fly and tick and infestation by keds and sheep lice. Accommodation for all of these operations, and also the veterinary treatment of sheep, will continue to be required on most hill farms. If this can be a combined and simple layout, sited conveniently to the homestead, with easy access for the sheep and also wheeled traffic, and to water as well as perhaps other services, so much the better as not only will it cater for the increasing size of flocks in some cases, but might prove economical in the use of the available labour force.

The site chosen for a combined layout should preferably be sheltered from the wind and it should be remembered that a flock of sheep moves more easily uphill. Drainage on a sloping site is not difficult, but care must be taken to prevent the discharge of toxic residues to a watercourse.

Although the dipping usually takes place in the open, shearing is done more often under cover. It is, therefore, desirable that the site chosen should be adjacent to buildings which will serve as the shearing shed and provide overnight accommodation for the flock. Almost any building is suitable for shearing provided it has sufficient height for hanging the equipment. For the construction of the pens, wood has stood the test of time and remains the most popular material. In some areas, however, local stone is readily available and can be used to great advantage. The circular catching pen is a useful labour-saving device in forcing sheep to the dip, footbath or race.

The area of the holding and draining pens will depend on the size of the flock. An enclosure where the whole flock can be held prior to being dipped

is desirable. Earth floors to pens are common on dry soils. Hardening can be done with stone, rubble, gravel or roughened concrete. The pens where animals are held before passing into the dip or race should be laid with hardcore. Clearly it is necessary for the draining pen floor to be covered with concrete.




**Sheep Handling Pens**

1. *Vertical lift gate*
2. *Draining pen*
3. *Footbath*
4. *Race*
5. *Handling area*
6. *Working area*
7. *Dip*
8. *Forcing and catching pen*
9. *Holding pen*
10. *Lambing and shearing shed*
11. *Access and loading point*
12. *Stock buildings*

## One man's answer

These considerations were in the mind of Mr. Robin Furness when planning new pens on his farm at Hamsterley, Co. Durham.

A layout (illustrated by the sketch plan) has been constructed in the farmyard, making it convenient for the family to help as the occasion demands. As it is close to a piped water supply it is unnecessary to carry water to fill the dipping bath. A cart shed and cattle yard can be converted for the overnight housing of the flock before shearing or at lambing time.

The circular catching pen which is of proprietary manufacture is constructed of galvanized iron. The other pens are of wooden post and four-rail fencing. The vertical lift gates leading from the draining pens can be operated from the working space by the dip. Covers prevent rainwater from filling the footbath and dip and so avoid weakening the disinfectant solution which they contain. The handling area should be adequate to allow one man to work comfortably yet not so wide that a sheep can escape and avoid treatment.

Agriculture is moving with the demands of a scientific age. Why not consider giving your traditional methods a new look to meet it?

# Books

**Soil Organic Matter.** (2nd Edition). M. M. KONONOVA. Pergamon Press, 1966. £5 5*s*.

This classic book is a revised and enlarged version of the first edition published in Britain in 1961. Naturally the author turns to Russian work for many references but in the appropriate chapters there is wide acknowledgment of workers in many other countries, and this, together with the excellent translations, makes it a truly comprehensive book.

The subject matter is separated into eight sections, only one of which is devoted entirely to organic matter in soils of the U.S.S.R. The other seven parts deal with aspects of organic matter that are of general interest to all soil scientists.

First there is a short but very interesting account of the history of soil humus studies which leaves the reader in no doubt as to the complexity of the subject. The contemporary views on the composition of organic matter are developed in the second chapter, and here a broad division is made between two components of organic matter. On the one hand a very diverse group including the components of decomposing residues and products of microbial activity which are identifiable as specific organic compounds, whilst on the other there are the humus materials described as complex structures formed by condensation reactions. The author takes care to point out that these humus materials cannot be regarded as a mixture of identifiable organic compounds, but rather as a polymerized system of variable constitution in which some of the variation in composition can be accounted for by the genetic grouping of soils. The biochemistry of humus formation is discussed in chapter three and here the role of bacteria is properly emphasized in the many processes occurring between plant tissues and their eventual fate as humic compounds.

Having considered what organic matter is, and how it is formed, the author turns to a review of the importance of organic matter in soils. This is a surprisingly short chapter, but although the section is by no means comprehensive and leaves unmentioned important topics, the content is both interesting and stimulating. Four main roles are mentioned; the part played by organic matter in the weathering of rocks, as a source of nutrients for plants, as a formative agent in promoting water stable structures, and in producing a direct effect on growth and development of plants.

Chapter five is a review of natural factors as they affect humus formation and is an introduction to the next section, an account of the humus forms of the main soil types of the U.S.S.R. This section discusses the principles behind the variation in type and quantity of organic matter in soils of the Tundra Region right through to the Krasnozems of the subtropical areas in Western Georgia and on the Black Sea coast.

The last section of the text, about one-third of the book, is devoted to methods and techniques used in the investigation of organic matter; it forms a useful reference but a surprising omission from it is any reference to microscopic techniques for the study of humus forms as pioneered by Kubiena. This omission emphasizes the importance that the author places on the chemical constitution of organic matter.

This book is a valuable addition to the library of all soil scientists and will be used for reference and as a text-book for several years ahead.

*D.B.D.*

**The Principles and Practice of Feeding Farm Animals.** (Including Animal Management.) 5th Edition. E. T. HALNAN, F. H. GARNER and A. EDEN. The Estates Gazette, 1966. 76*s*.

There is no fundamental biochemistry in this book but it contains sufficient of the elementary physiology of digestion and metabolism for its purpose. Its main function is to provide practical information and advice to those who have to tend and feed livestock, and this is excellently fulfilled for the most part.

The first three chapters deal with the chemical nature of foods and of livestock products, outlines of digestion, the functions of minerals, vitamins and various modern additives. The fourth and fifth introduce the conceptions of starch equivalent, metabolizable energy, digestible crude protein and other matters of quantitative nutrition. Full credit is due for the clear and logical presentation of these. Tribute must also be paid to the ingenious tables, devised to

assist in balancing rations for milk production, which have replaced the equally ingenious tables of previous editions.

The second quarter of the book is disappointing. One has the impression that authority for revision has been omitted for this portion. Much of the wording has remained unchanged for several editions and there are references to outdated practices. 'No man putteth a piece of new cloth unto an old garment for the rent is made worse'. The rents between statements here and the modern treatments in later chapters are many and obvious. But one startling innovation invites us to believe that fish meal is not of animal origin! Yet there is much that is of value in this section and useful information is available to anyone who is able to distinguish between the obsolete and the viable. Even so, there is perhaps an undue emphasis on crops and practices relating mainly to East Anglian agriculture and this tinges matters which ought to receive a more general treatment.

The second half of the book shows a welcome improvement. The chapter on the feeding of dairy cows has been modernized and has much to offer. The next chapter (fattening cattle) contains excellent discussions of the various systems of modern beef production from the younger animal as well as from the mature. The chapter on sheep is full of useful husbandry advice and is marred only by the reproduction of an old feeding calendar where most of the arable crops mentioned are admitted to be no longer grown. One wondered how the section on horses could be retained but a clever switch from haulers to hunters and hacks saved the day!

The chapters on pig and poultry feeding are especially good. The logical presentation of the poultry section in particular is admirable and a great deal has been packed into a relatively small space. Finally, one of the highlights of the book is an essay on future developments in animal feeding. This reveals breadth of outlook along with a forward-looking awareness of the direction in which economic and sociological trends will steer the course of animal husbandry. One hopes there will be a further edition in which the imagination here revealed will be able to fulfil itself.

The book is beautifully produced on glossy paper which does justice to the many photographs but it contains a number of misprints. Some of these are particularly unfortunate in that they ruin a calculation intended by way of illustration. Also, a more complete index could have been designed. Several topics which should have been obvious are not listed. *S.M.B.*

**Herbicides in British Fruit Growing:** A Symposium of the British Weed Control Council. Edited by J. D. FRYER. Blackwell Scientific Publications. 1966. 42*s*.

This symposium, held on 24th February, 1966, was well attended by scientists, teachers, advisers, manufacturers' representatives and growers of all kinds of fruit. The subjects were broadly based, admirably arranged and well presented.

This publication of the proceedings is equally well organized and edited and includes a few illustrations. Anyone in doubt about the wisdom of using herbicidal chemicals in fruit growing, or who wishes to get a grasp of the state of development of the use of such chemicals in fruit growing, or needs to be reassured concerning the speed with which chemicals are replacing the cultivator and the hoe, should read this book. In fact, anyone interested in the technical or philosophical aspects of chemical weed control in fruit plantations will find the proceedings of this symposium a valuable guide to the present position. A wide-ranging survey of the development and present use of herbicides in fruit growing by F. A. Roach adequately covers this field.

The deficiencies in our present knowledge are laid bare, and this, one of the most valuable aspects of many papers, should assure those who feel that undue risks are taken by applying herbicides without thought of consequences, and will deepen the concern of those who so far have given no thought to possible future repercussions. K. Holly's paper, in particular, helps one to see more clearly how much more information and research is needed on the subject of the fate of herbicides in the soil. L. C. Luckwill's paper shows us how he and his colleagues are learning to measure the effect of doses of herbicides absorbed by fruit plants, and E. W. Russell draws attention to those soil conditions regarded as of high importance for successful crop growing, which could be affected by the cessation of cultivation, and absence of a cover of herbage due to the application of herbage controlling chemicals.

The thoughts that this symposium cannot fail to stimulate are that progress is phenomenal in the use of chemical weed control in all forms of fruit plant production and fruit growing. Also, that many able men are searching for safer materials, or chemicals with a wider or longer-lasting range of action, or chemicals less capable of doing damage to fruit crop plants. Finally, the need for more work on the whole subject of chemical weed control in fruit growing is made clear. This we can all support. *L.F.C.*

**The Glory of the Tree.** B. K. Boom and H. Kleijn. Harrap, 1966. 84*s*.

One is growing accustomed nowadays to the unceasing flow of lavishly illustrated books on natural history subjects. Their popularity is mainly due to an abundance of colour photographs, and in some cases, the number of illustrations is in inverse ratio to the amount of text. Fortunately, *The Glory of the Tree* is not one of these. It is true that there are nearly 200 plates in colour and numerous line drawings but there is no lack of text. The authors have produced a stimulating work which should prove most helpful to everyone interested in the subject of trees.

In fact, as stated in the preface, it is intended for 'those who enjoy the outdoors, who keep their eyes open for what there is to be seen and who wish to know something more about what they see'. It is in no sense a text-book of the world's trees and the difficulty of selection has been overcome by including only those trees which are indigenous to or generally cultivated in western and southern Europe and certain parts of north America. The trees are grouped into families and then into genera. Keys to identification are provided only for the conifers but the descriptive details provided, coupled with copious illustrations, make identification very easy. The botanical characters of each species, which are given in some detail, are supplemented by interesting information of a more general nature such as facts concerning culture, properties of the timber, legends connected with the trees and medicinal uses. The history of the so-called living fossil, *Metasequoia glyptostroboides*, which appeared on the horticultural scene only twenty years ago, is given at some length. The omission of the Witch Hazel, *Hamamelis mollis*, is probably due to the fact that it is usually grown as a shrub though it is sometimes seen as a small tree up to twenty feet in height. *Magnolia grandiflora* is regarded by the authors as not being hardy in colder zones, though in Britain, especially in the south, many fine and very old specimens are to be seen growing against walls.

The colour plates are almost all of a high standard and the close-ups beyond reproach. The habit figure of *Crataegus monogyna*, however, is very poor and might well have been omitted. The flower of the Tulip Tree, *Liriodendron tulipifera*, is very attractive but the particular specimen figured in the book is overblown and quite uncharacteristic. A slightly irritating feature is the absence of captions on the colour plates. They are numbered, it is true. but since they do not face the relevant text much time can be spent in searching for a particular illustration.

An original supplement is the inclusion of a list of postage stamps which incorporate temperate trees in their design, and there is a very useful glossary of specific names which should prove helpful to the reader with little Latin. The English translation from the original Dutch has been expertly carried out and no printers' errors were detected.

The book concludes with a list of botanical gardens and other collections of woody plants, a selected bibliography and a good index. For its general readability and wealth of information it can be thoroughly recommended to the expert and layman alike.

*F.B.*

**Darwin on Humus and the Earthworm.** Faber and Faber, 1966, 18*s*.

First published in 1881, Charles Darwin's *Vegetable Mould and the Earthworm* was reprinted in 1945 by Faber and Faber under the above title and with an introduction by Sir Albert Howard. This reprint is now re-issued by the publishers.

Anyone who wishes to learn more about earthworms than their anatomical structure should read this book. Darwin's meticulous observations and experiments remain an object lesson to all engaged in scientific work today. The summary of subject matter for each chapter facilitates reference to those aspects of earthworm activity that interest the reader.

Darwin dealt in detail with two main aspects and showed how earthworms manipulate and utilize many different kinds of leaf and other objects. Similar experiments carried out in more recent years have confirmed many of his results. He further compared the relative quantities of worm casts produced on different soils and estimated the rates of the burial of objects ranging from small stones to ancient buildings. Darwin was mainly concerned with the effect of earthworms on the soil structure. Modern soil chemistry has produced evidence that earthworms can also effect changes in the chemical composition of the soil, although to what extent is not yet fully clear.

Darwin studied earthworms only in undisturbed habitats such as forests and permanent grassland where there is no doubt that worms considerably influence the soil structure. In arable land, mechanical cultivations overshadow many earthworm activities such as burying and mixing

plant remains, improving drainage and aeration. It remains difficult to demonstrate the value of earthworms in agriculture on a field scale and in some respects Darwin's approach has not yet been improved upon.

Sir Albert Howard's introduction departs in places from the standard of scientific objectivity that is the hallmark of the main work. It is a pity that the publishers have not presented a more balanced view on such topics as the use of artificial fertilizers and pesticides, particularly as this has been a major subject for scientific investigation since the foreword was originally written, and now that very much more information is now available.

*R.N.B.P.*

**The Soils of the Church Stretton District of Shropshire.** (Memoirs of the Soil Survey of England and Wales). D. MACKNEY and C. P. BURNHAM. 1966. 35*s*.

This recently published memoir of the Soil Survey deals with an area of 216 square miles in South Shropshire. The district, which is of considerable scenic beauty, is predominantly one of 'mixed farming', but because of considerable variations in soil, altitude and climate, a wide range of farming types is found. These include arable with some livestock in certain parishes, and true hill farming in mountainous districts such as the Long Mynd.

The memoir, which is accompanied by two maps, is of considerable length and detail, and contains material which will be of interest to a large number of people including soil scientists, agriculturists, foresters, geographers and others. The value of the memoir is increased in that some of the soils described are of widespread occurrence outside the surveyed area.

The publication contains eight chapters, each of which is divided into a number of sub-sections. The first six chapters are concerned with a description of the physical features of the area and its geology, climate, and agriculture, and of the soils found in it. The last two chapters deal with the agronomic significance of soil, site and climate, also with the properties and management problems of the soils which have been mapped. The soil scientist would wish to see these questions discussed at greater length, but no doubt the authors refrained from so doing to avoid lack of balance in the publication, which is primarily concerned with a description of soils, and because such subjects are still imperfectly understood in some respects. However, there is much of interest in these two chapters, backed up by factual data where this is available.

The two maps accompanying the memoir are, firstly, a map of the soils which is clearly printed in colour, and secondly, a land capability map. This last is based on the system of Klingebiel and Montgomery, which has been used extensively in the U.S.A., and in which land is divided into a number of major classes, ranging from land which can be used for almost any purpose, to land which is only suitable for rough grazing or perhaps forestry. Within each class, sub-classes are defined which show the type of limitation on land use, e.g., of soil wetness, stoniness, steepness of slope, etc. It is a pity that this map also could not have been printed in colour, although no doubt this was because of cost, but it is a very interesting example of the type of secondary map which can be constructed once a basic soil map is available. In the memoir itself there are also a number of 'secondary' maps including one which shows the estimated available water capacity of the different groups of soils.

All in all, the authors and the Soil Survey are to be congratulated on the production of this valuable memoir.

Copies may be obtained from the Librarian, Rothamsted Experimental Station, Harpenden, Herts., price 35*s*.

*W.D.*

**Introduction to Livestock Production.** (2nd Edition). H. H. COLE. Freeman, 1966. 66*s*.

This volume, which was first issued in 1962, is intended to provide students with a comprehensive view of the livestock industry and to show how biological science is utilized in modern management.

This has rapidly changed in the last generation, especially in the U.S.A. The day has passed when producers raised animals of their choice and sold them for what they could get in the market place. The present day concept is based on consumer specifications and on products which will retail at prices attractive to the housewife. Most advanced countries are moving in this direction.

So, with a changing livestock industry, goes the need to readjust and modify student

curricula; perhaps we should all regard ourselves as students in this context.

There are forty U.S. contributors; consequently, much of the data and chapter references are largely drawn from research in that country. However, as many of the authors have well-known reputations outside North America and are dealing with fundamental principles, the book should have almost a global appeal. For example, the opening chapter by Dr. Ralph Phillips (ex FAO) refers to breeds, husbandry practices and animal products in many parts of the world. He then relates these to world population trends.

The animal products which are discussed are meats, milk, wool and mohair, eggs and poultry meat. According to consumer studies in the U.S.A., tenderness is the most important attribute for acceptance of beef. It is stated, however, that body type or conformation is unrelated to tenderness, and that steaks from Jersey steers of inferior beef type were found, on average, to be more tender than corresponding cuts from Hereford and Angus steers.

Section II deals with breeds of livestock which produce the above products. This is largely historical.

Section III covers the genetics of inheritance and selection. Heritability estimates are considered in some detail and so are the various mating systems which tend to produce the type of livestock which the market needs. Performance and progeny tests are important weapons. Equally fundamental, but much more complex, is the relationship between the central nervous system, the endocrine glands and hormones and the reproduction processes. Nutrition and the digestive mechanisms also enter this section.

To the general United Kingdom reader, the section dealing with classification, grading and marketing of livestock and their products is of significance. While it is not suggested that we should adopt U.S. methods on a wholesale basis, their grading systems for live and dead animals may well provide a modified foundation for Britain. In addition, market intelligence, price trends, and seasonal patterns are all features where a good deal more research is needed in Britain.

The last section of this book deals with diseases and their effects on animal output. The classic campaign for Screw Worm control in Florida is rightly given some prominence.

This is a well-produced volume covering a very wide field of knowledge which is clearly and simply stated; the index is excellent.

*H.E.*

## Books Received

*Winter Wheat in 1963 and 1964*. K. Mathias. Bulletin No. 116/EC61, Department of Agricultural Economics, University of Manchester, 1967. 4*s*.

*Farming in the East Midlands*. Financial Results 1965–66. F.R. No. 162. Department of Agricultural Economics, University of Nottingham, 1967. 5*s*.

*The Development of Farm Models as an Advisory Aid*. A Study of Lowland Farming in Central Lincolnshire. K. A. Ingersent, E. S. Carter and J. M. Adams. F.R. No. 165. Department of Agricultural Economics, University of Nottingham, 1967. 5*s*.

*Market Price Intelligence for Dessert Apples*. J. Chivers and J. H. Kirk. Copies from the Secretary, Wye College, Wye, Ashford, Kent, 1967. 7*s*. 6*d*.

*Potassium and Japonica Rice*. Summary of twenty-five years' research. International Potash Institute, Berne (Switzerland), 1966. 3.50 SFr.

*The Journal of the University of Newcastle upon Tyne Agricultural Society*. Volume 20, 1966. Price to non-members, 5*s*.

*Tomato Grading*. Horticultural Labour Studies No. 3. R. Turner and R. D. Murray. Research Bulletin No. 39. The West of Scotland Agricultural College, 1967.

*Annual Report of Studies in Animal Nutrition and Allied Sciences*. Volume 22. Rowett Research Institute, Bucksburn, Aberdeen, Scotland, 1966. 10*s*.

*Capital Investment in Fixed Equipment and Machinery on a Sample of Farms in South-West England, 1964-65*. G. D. D. Davies and W. J. Dunford. Report No. 161. Department of Agricultural Economics, University of Exeter, 1967. 2*s*. 6*d*.

*Free Bread for Everyman*. An essay on world hunger and production requirements. Peter Harsany. Academic Publishing Co., Montreal, Canada, 1967. $4.80.

*Finance for Farmers*. The Ernest Sykes Memorial Lectures, 1967. Institute of Bankers. 7*s*. 6*d*.

# AGRICULTURAL CHEMICALS APPROVAL SCHEME

**Since the publication of the 1967 List, the following products have been approved:**

## INSECTICIDES

**CHLORFENVINPHOS**
*Granular Formulations*
Sapecron Granules—Ciba

## HERBICIDES

**2, 4-D**
*Ester Formulations*
Cleanacres 2, 4–D Ester—Cleanacres

**DICHLORPROP with 2, 4-D**
*Amine Salt Formulations*
Garners Polykill-Plus—Sidney Garner and Sons Ltd., The Granaries, Sutton Bridge, Lincs. (Sutton Bridge 464)

**DICHLORPROP with MCPA**
*Potassium and Sodium Salt Formulations*
Stantox Double Plus—S.D.C. Pesticides

**DICHLORPROP with MECOPROP**
A further mixture of dichlorprop other than those listed in the 1967 list has now been approved. This is a translocated weed-killer for post-emergence use in cereals. Controls many broad-leaved weeds especially redshank and black bindweed as well as those weeds controlled by mecoprop.
*Potassium and Sodium Salt Formulations*
Redipon—Campbell

**MECOPROP**
*Potassium and Sodium Salt Formulations*
Garners C.M.P.P.—Garner

**SODIUM MONOCHLORACETATE**
*Soluble Powders*
Herbon Somon—Herbon

## SEED DRESSINGS

**ORGANOMERCURY**
*Dry Dressings*
Ceresan NS—Plant Protection

---

ACKNOWLEDGEMENT OF PHOTOGRAPHS

We gratefully acknowledge permission to use the following photographs:

Front cover *Farmer's Weekly*. P. 208 *The Sun*. P. 218 John Topham Ltd. P. 220 T. L. Burton. Pp. 223 and 224 Scottish Horticultural Research Institute. P. 227 Soil Survey of England and Wales. Pp. 235, 236 and 238 Hector Fraser.

*AGRICULTURE*

Price 1s. 3d. net monthly (by post 1s. 9d.).

Subscription Rates, Home and Overseas: £1 1s. 0d. per annum (including postage).

*Subscriptions may start with any issue and should be sent to:*

HER MAJESTY'S STATIONERY OFFICE

49 High Holborn, London W.C.1
13a Castle Street, Edinburgh 2
Brazennose Street, Manchester 2
35 Smallbrook, Ringway, Birmingham 5
423 Oxford Street, London W.1
109 St. Mary Street, Cardiff
50 Fairfax Street, Bristol 1
7-11 Linenhall Street, Belfast 2

Single copies can be purchased from any of the above-mentioned addresses or through a bookseller.

Printed in England for Her Majesty's Stationery Office
by Hull Printers Limited, Willerby, Hull, Yorks.

(K102) 72-1-67-5

# Whose grazing nuts should you use?

—**Silcocks!** Because they consult the cattle on their experimental farms in formulating these critical rations, Silcocks have been able to determine exactly the blend of ingredients cows must have to make maximum use of spring grass.

## How much should you feed?

Why not consult the cattle on YOUR farm? Their performance, interpreted by the unique Silcock Milk-from-the-farm formula will enable you to decide the precise quantity of EARLY GRAZING NUTS to ensure optimum performance at the lowest possible cost.

Ask your local Silcock Agent for details. But hurry – the demand for this service last year was heavy, and this spring it will be heavier still.

**SILCOCKS**

R SILCOCK & SONS LTD · STANLEY HALL · LIVERPOOL 3

CERTROL
CERTROL
CERTROL

For Mayweed and other resistant weeds

WEEDAZOL
WEEDAZOL
WEEDAZOL

For Couchgrass, stubble and perennials in orchards

PRODUCTS OF ARCHER RESEARCH
FREEDOM FORMULATIONS

Marks
A. H. MARKS & CO. LTD., WYKE, BRADFORD, YORKS
Telephone: Bradford 676372
Telegrams: Colour, Bradford

TAS/MK84A

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

**Experimental Husbandry**

Gives accounts of husbandry experiments carried out at both experimental husbandry and commercial farms throughout the country. It should have a wide appeal to farmers, their advisers, research workers and students.

**Experimental Horticulture**

Designed for commercial growers of fruit, flowers, vegetables and crops under glass, this publication contains accounts of experimental work and its bearing on practical problems in the field.

*These publications are issued at irregular intervals (about two or three times a year)*
*Prices range from 6s. to 10s. (postage extra)*

**Government publications can be purchased from the Government Bookshops in London (post orders to PO Box 569, S.E.1), Edinburgh, Cardiff, Belfast, Manchester, Birmingham and Bristol, or through any bookseller**

ONE PENNY 1965 ELIZABETH II DEI GRA

A DAY FOR BETTER SILAGE!

**Did you know that 2d. is the average cost per cow per day of including Molassine Meal to preserve and improve your silage? Full details from your usual merchant or The Molassine Co. Ltd.**

MOLASSINE MEAL
MAKES ALL THE DIFFERENCE!
THE MOLASSINE CO. LTD., TUNNEL AVENUE, GREENWICH, LONDON, S.E.10

**EVENSTORM IRRIGATION—**

★ Rotary sprinklers ★ Rain guns
★ Organic irrigation (effluent disposal)
★ Portable aluminium mains
★ Glasshouse and outdoor spray lines

**EVENTHERM SPACE HEATERS—**

**Portable, oil-fired, up to 200,000 B.T.Us. Thermostatically controllable for frost protection in potato stores, etc.**

**Details from EVENPRODUCTS LTD., Evesham, Worcs. Tel. Evesham 6633/4.**

**STAFF VACANCIES**

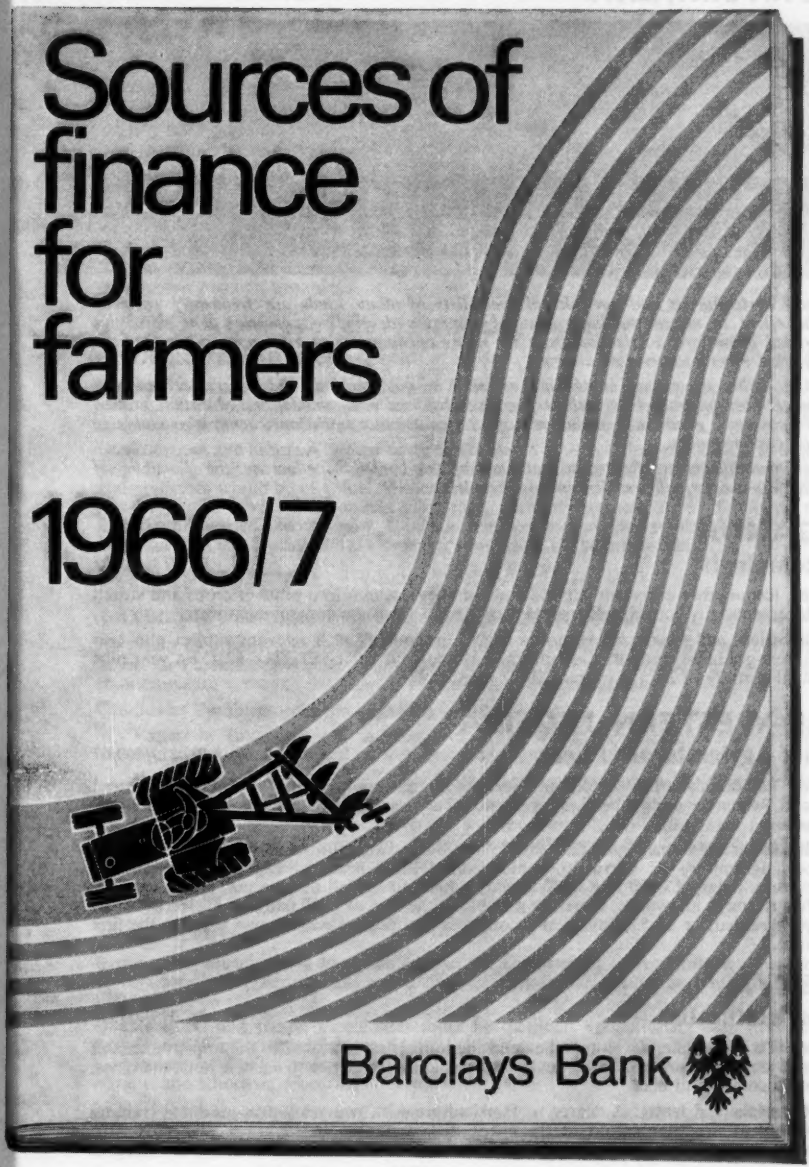
Agricultural colleges, Institutes and University departments
Commercial undertakings, etc.

***Attention!***

For the best results advertise your staff vacancies in the Journal of the Ministry of Agriculture

***Agriculture***

*Full details from the Advertisement Representatives:*
**COWLISHAW & LAWRENCE (Advtg) LTD**
**16 Farringdon Street, London E.C.4**
**(Smallest bookable space ¼th p.)**




This is the current edition of Barclays guide to grants and loans available to farmers. Written in consultation with the Ministry of Agriculture, it is of proven value to farmers and others interested in agricultural finance. Copies may be obtained free from any branch of the Bank.

**BARCLAYS BANK**

*Money is our business*

## OFFICIAL APPOINTMENTS

*General agriculturists and agricultural specialists of many kinds are frequently required in the effort to match the large demand from the developing countries. The vacancies advertised below are a selection from the many openings which exist now. While they are being filled, other vacancies are arising.*

*Salaries within the ranges quoted are assessed on qualifications and experience; and the terms of most appointments include free or subsidised accommodation, education grants, family passages, good leave on full pay, etc. A contributory pension scheme is available in certain circumstances.*

*Most appointments are limited to nationals of the United Kingdom or the Republic of Ireland who are normally resident in those countries.*

### UGANDA

#### Entomologist

*RC 213/183/07*

**Duties:** Required to carry out surveys and conduct research into pests of crops and stored produce, especially cotton, coffee and cocoa and to advise on control measures.

**Qualifications and terms:** An Honours degree in Zoology or a relevant subject plus two years post-graduate study in Agricultural Entomology. Salary £1,374—£2,757 a year plus terminal gratuity of 25%. Contract 21–27 months.

### MID-WESTERN NIGERIA

#### Chief Agricultural Officer

*RC 213/200/01*

**Duties:** To administer the Agricultural Services Division of the Ministry of Agriculture and Natural Resources and to be chief professional adviser to the Minister on all agricultural matters.

**Qualifications and terms:** Candidate should be a trained agriculturalist with a degree in pure science, agriculture or horticulture plus considerable practical experience in tropical agriculture. Salary £3,000 to £3,500 a year, subject to British income tax, plus a variable tax-free overseas allowance, currently payable at the rate of £730 (single), £1,330 (married unaccompanied) or £1,535 (married accompanied) a year. Contract two years in the first instance.

### KENYA

#### Horticulturalist

*RC 213/95/037*

**Duties:** To investigate, develop and extend the industries dedicated to the improvement of tropical tree crops on the Kenya coast with particular reference to cashew nuts, mangoes, citrus, coconuts and bixa.

**Qualifications and terms:** A degree in Horticulture with two years post-graduate training preferably in experimentation of the crops. Salary £1,374 to £2,757 a year plus 25% terminal gratuity. Two year contract.

### TANZANIA

#### Agricultural Officer (Economist)

*RC 213/173/07*

**Duties:** To advise on commodity policy, marketing, distribution grading, storage and surveying of agricultural commodities. To make farm management and surplus disposal studies.

**Qualifications and terms:** A degree in agricultural economics and a knowledge of tropical agriculture. Salary £1,329 to £2,757 a year plus 25% terminal gratuity. Contract 21–27 months.

## OFFICIAL APPOINTMENTS

# PAKISTAN

## Specialist in Nematology

*RC 213/137/01*

**Duties:** Required at the Tarnab (Peshawar) Agricultural Research Institute to make a survey of Nematode infestation, the damage caused and the identity of the species; and to initiate small-scale experiments on their control in selected crops. Duties will also include the training of one or more Pakistani graduates in entomology, agriculture or other allied subjects to carry on this work; and advice on the setting up and equipment of a small laboratory at Tarnab, which is to become nucleus of nematological research in Pakistan.

**Qualifications and terms:** A degree in Entomology or Zoology with specialisation in Nematology; previous overseas experience desirable. Salary £2,500/£3,250 p.a. subject to British income tax, plus a variable tax-free overseas allowance, currently payable at the rate of £595 (single), £1,140 (married unaccompanied), or £1,325 (married accompanied) a year. One-year contract in first instance.

# TRUCIAL STATES (Arabian Gulf)

## Agricultural Adviser

*RC 213/141/01*

**Duties:** To advise both the farmers and Rulers of the States and to supervise an Agricultural Trials Station near Ras al Khaimah, two other gardens, and an elementary agricultural school. The Officer will be expected to travel extensively.

**Qualifications and terms:** A degree or a good diploma in agriculture and wide experience of irrigation agriculture under arid conditions. Experience in agricultural statistics, marketing and pesticides would be of value. A knowledge of Arabic an advantage. Salary £2,500 p.a. (tax-free), plus a variable overseas allowance, currently payable at the following rates, £1,025 p.a. married accompanied, £900 p.a. married unaccompanied and £430 p.a. single. Contract with the Trucial States Council for two years in the first instance.

# PHILIPPINES

## Taxonomic Botanist and a Pasture Agronomist

*RC 213/143/012*

An expert in Botany (taxonomy and classification of tropical grasses and legumes) and an expert in Pasture Agronomy are required to assist in the completion of an ecological reconnaissance survey of the grassland resources of the Philippines.

Candidates should possess the following qualifications:

**Expert in Taxonomy** and the classification of tropical grasses and legumes with a degree in Botany or allied subject. Interest in and experience of ecology.

**Pasture Agronomist.** Degree in Botany or Agriculture. Interest in and experience of ecology.

Salary £2,750 to £3,250 subject to British Income Tax, plus a variable tax-free foreign service allowance, currently payable at the rate of £550 to £1,255 a year depending on domestic circumstances. Twelve months contract.

# MALAWI

## Soil Surveyor

*RC 213/134/04*

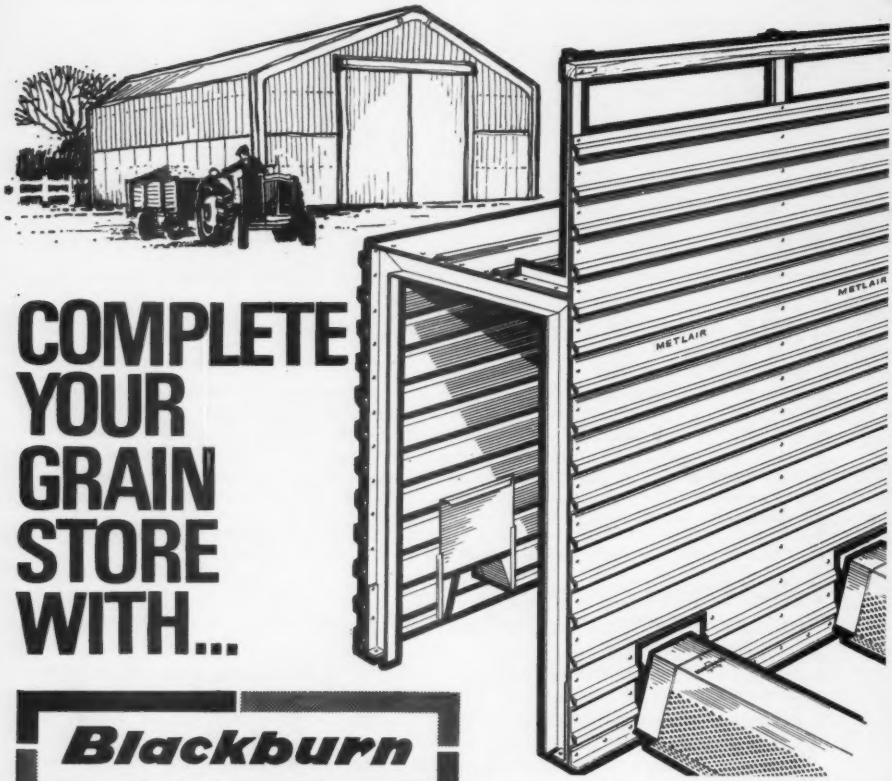
Required to set up a soil survey section in the Department of Agriculture to undertake surveys for developing projects; and later to train Malawian graduates to take full responsibility.

**Qualifications and terms:** Candidates must be qualified agriculturists with appropriate post-graduate experience. Salaries £1,485—£2,600 a year plus 25% terminal gratuity. A supplement of £100 a year is also payable direct to an officer's bank account outside Malawi and Rhodesia. Contracts 2–3 years.

***If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:***

**Appointments Officer**
**MINISTRY OF OVERSEAS DEVELOPMENT**
**Room 324a, Eland House, Stag Place,**
**London, S.W.1.**

**MINISTRY OF OVERSEAS DEVELOPMENT**




# COMPLETE YOUR GRAIN STORE WITH...

**Blackburn**

# METLAIR

## MAIN AIR DUCT

The new BLACKBURN METLAIR Air Duct has been designed to combine low cost with high efficiency. Its greater cross-sectional area over present systems increases efficiency by reducing air speed through the duct. Only £18 per 6ft × 3ft (18 sq. ft) section, i.e., £1 per sq. ft of cross-sectional area—compare it with square footage of comparative systems—you'll be surprised!

The main duct assembly is available in many forms—all from standard components. Either 4ft or 6ft heights are available. If grain storage is required at an 8ft depth, a standard 2ft high extension can be fitted. To increase the cross-sectional area of the duct by 6 sq. ft, a 'U' conversion is available.

**● All galvanised construction ● Immense strength and durability ● Fan sizes up to 48,000 c.f.m. accommodated**

**● Spigots to suit all types of lateral as standard equipment ● Floor cleat used either as grouting-in connection or floor bolting ● Efficiently dries up to 1,000 tons of grain from one tunnel installation ● Ministry approved.**

***Write for details:*** **BL59**

**BLACKBURNS DEVELOPMENTS (Coningsby) LTD.**
**CONINGSBY, LINCS. Telephone: Coningsby 466**